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Contracting for ABS: The Legal and Scientific Implications of Bioprospecting Contracts

ABS Series No. 4

Shakeel Bhatti, Santiago Carrizosa, Patrick McGuire, Tomme Young, Editors

IUCN Environmental Policy and Law Paper No. 67/4

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Foreword

It is my pleasure to present this book *Contracting for ABS: The Legal and Scientific Implications of Bioprospecting Contracts*, edited by Shakeel Bhatti, Santiago Carrizosa, Patrick McGuire and Tomme Young, which is published as IUCN Environmental Policy and Law Paper (EPLP) No. 67/4. This book represents an important contribution to the body of ABS literature currently available and is provided at a critical time in the development of ABS as a functional concept and international regime. It is a part of IUCN's EPLP series, which dates back to 1972 and has through 35 years maintained a high standard of legal scholarship and quality outputs.

The ABS Series, which includes this book, is the first 'sub-series' within the EPLP series, designed in this way to maximize the usefulness and accessibility of these writings to the broad range of participants addressing the ABS challenges at both national and international levels. We believe that this Series offers a substantial contribution that will enable progress on an issue which has, to now, been stymied both by its complexity and by its controversial nature. It is only through the understanding of those complexities that consensus and useful compromise can be attained that will resolve the controversies and enable a functional system for achieving the all-important equity objective of the Convention on Biological Diversity.

Dr. Alejandro Iza
Director
IUCN Environmental Law Centre
June 2007

Series Editor's Preface

In the course of *The ABS Project*, IUCN's Environmental Law Centre has taken a central position in promoting researched and balanced analysis of critical components of the current discussions of the international regime on access and benefit sharing under the CBD. *The ABS Series* provides the culmination of these efforts, enabling recognized experts to undertake intensive research and present detailed, balanced, and reasonable analysis. It operates as a counterpoint to the growing numbers of authors whose work in ABS issues is sometimes focused more on advocacy than on research. With this Series we are trying to take a very different approach and to achieve a very different objective. Simply put, we hope to provide a deeper understanding of the legal, economic, practical, and factual issues affecting the debate, and to build our analyses and recommendations on intensive legal research.

This fourth book in our Series, entitled *Contracting for ABS: The Legal and Scientific Implications of Bioprospecting Contracts,* is designed to provide two types of information that have sometimes been in short supply. First, it focuses on contractual issues – analysis of ABS Agreements as legal contracts, and legal advice regarding the ways that they are different from (and more difficult to negotiate than) other types of legal instruments and contracts. Second, it attempts to fill a significant gap in the awareness and information available to persons negotiating the contracts regarding the scientific, technical, and practical activities that the users will be undertaking – activities that must be addressed by the Agreement.

The editors and contributors of this book include a number whose names and reputations are well known in conservation and genetic resources policy, including Shakeel Bhatti, who headed the Genetic Resources, Biotechnology, and Traditional Knowledge Section of the World Intellectual Property Organization when the writing of this book began and has since been named Secretary of the International Treaty on Plant Genetic Resources, Santiago Carrizosa, currently Regional Technical Advisor for Biodiversity with the United Nations Development Programme/Global Environmental Facility, and Patrick McGuire, who headed the UC Genetic Resources Conservation Program. It is my pleasure, as well as my duty on behalf of *The ABS Project* to express my gratitude to these and all contributors to this book.

This book and indeed the entire Project owe a great debt to our primary financial supporter, the German Federal Ministry for Economic Cooperation and Development (*Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung* or BMZ), and especially to Julia Kaiser, Andrea Laux and Frank Schmiedchen – without whom this work could not have been completed. Numerous other partners and collaborators have also made important and sustaining commitments for which we are very grateful.

Finally, without the support and foresight of Dr. Alejandro Iza and the IUCN Environmental Law Centre, this book and all of the other works of *The ABS Project* would not exist. It was through Dr. Iza's efforts that *The ABS Project* became a reality, and his understanding of the difficulties in its implementation as well as his support and the unstinting assistance of the staff of the Environmental Law Centre in producing this book, including Legal Officer Jane Bulmer, Project Assistant Ann DeVoy, Senior Information and Documentation Officer Anni Lukács, and Documentation Assistant Monica Pacheco-Fabig. Collectively, these individuals have been the primary reason that the Project could finish its work and that outputs throughout the term of the project have achieved the level of legal excellence expected of the IUCN Environmental Policy and Law Papers, among which *The ABS Series* has been included.

Tomme Rosanne Young
Series Editor and Project Manager, *The ABS Project*
August, 2009

About the Series

The ABS Series represents a response to two realities: First, the ABS issue is controversial and technically and legally complex. Because of the constant international concern over controversial policy and political issues, the primary focus of all writing on ABS has been focused on political positions and advocacy, even where the expressed purpose of a particular document is 'practical legal advice.' Lack of a rigorous body of ABS analysis has been one part of this implementation problem. Many professional inputs are characterized by opinions that are unsupported, or supported only by citations to the opinions of other experts or random references to or excerpts from laws and policy instruments, taken out of context.

To IUCN's Environmental Law Centre, it has become clear that the complexity and the controversiality are linked problems. Solutions to the international ABS controversies are currently stymied by the lack of credible, non-biased technical analysis of the elements and issues of national implementation. Serious in-depth analyses are needed concerning not only the few ABS examples, but also the kinds of legal options that are available and the manner in which they function. Simply put, one cannot build a structure without the right tools – and having the tools is meaningless without knowledge of what they can and cannot do.

The second 'reality' faced by this project is the fact that, despite the long-extending international negotiations, genetic resources are being taken, studied, developed, and utilized every day. Countries do not have the luxury of waiting for international negotiations to answer their questions, before taking action. It is consequently urgent for all parties (users, source countries, source communities and resource owners, user countries, researchers, middlemen, and others) to have some basis for taking these actions. More important, each party needs to have some certainty that this basis will be robust enough to protect its rights, even after international negotiations provide some guidance or assistance to all or part of the ABS issue. Even where national laws and practices exist, they are proving inadequate to this objective, in some measure owing to the lack of technical help, as described above.

Consequently, *The ABS Series* focuses on national implementation and the legal and legislative issues that must be addressed, rather than advocating or addressing a particular side or position in the international negotiations. Through this process, *The ABS Series* seeks to create the best possible basis of researched information on the practical application issue. It is thus not only a tool for national decision-makers but also for implementers. While it is not always possible to be certain that one has been unbiased, we have made an effort, at minimum, to note the existence of other credible positions on the issues discussed, and to give some reason why these positions were not more fully expounded.

As of this writing, the international process for development of the ABS regime is still ongoing. While not intended to 'influence' that process, *The ABS Series* has been designed and written in the hope that a better knowledge of the realities of ABS will enable the negotiators to develop the regime as a functional and effective tool of conservation, equity, and international development. As such, we believe that the books in this Series will continue to be primary works of scholarship and professional analysis on which the architects and implementers of the ABS regime will rely long after the negotiations have concluded. In addition, it is hoped that the authors in the Series (or a team of similarly qualified experts) will be engaged to update relevant books from the Series, when the time is right.

Target audiences: Writing for a broad audience can sometimes be challenging for lawyers. In *The ABS Series*, however, we recognize that our primary audience includes national decision-makers, NGOs, and others, as well as lawyers and economists. We have endeavored to present our research in an accessible way, without doing harm to our absolute standard of legal correctness. Although many readers would like a 'simplified' pamphlet-style analysis of the ABS issue, which can answer all of their questions in a few pages, this is not possible – the only simple fact about ABS is that it is not simple. *The ABS Series* provides summaries of the complexities in the issue that legal specialists must grapple with, but at the same time attempts to avoid 'legalese' and its companion 'econo-ese.' In this way,

we feel that *The ABS Series* provides both clarity and understandability for the non-lawyer, who may obtain a thorough grounding in the ABS issue through reading these books. For the legal or economics professional, however, these books also provide resources and information that will enable their deeper understanding of ABS issues.

The future: The ABS issue is still evolving. After the commencement of *The ABS Project*, the CBD entered on a groundbreaking process of re-evaluating ABS and attempting to develop the necessary tools, consensus, and understanding (e.g., a clearer and more functional 'international ABS regime') that will enable progress toward achieving the goals of the CBD. With this decision, *The ABS Project* underwent its first evolution. It had begun as a project aimed at helping national governments to find some positive steps to enable them to try to achieve the fixed language of CBD Article 15. In 2004, it necessarily expanded that focus – embracing the goal of informing all participants and interested persons (at national, regional, and international level) regarding the options, instruments, practices, and processes that can enable the ABS regime to become a functional mechanism for achievement of the CBD third objective. Only time can decide how far the international negotiations will go toward assisting and supporting ABS implementation. The team of professionals who have worked to provide *The ABS Series* hope that a useful and innovative result is quickly obtained, and that we will all have the opportunity to extend the work of this Series and to guide, analyze, and promote the new regime components that will be developed.

Acknowledgements

The editors and authors of this book wish to express our gratitude to those who made the most significant contributions to its completion and substantive correctness. Among these, we are grateful for information, documents, research, and other inputs from and for substantive input and comments from Jorge Cabrera Medaglia, Jorge Caillaux, Fernando Casas, Carlos Correa, Jose Esquinas Alcazar, Valerie Etim, Ute Feit, José Carlos Fernández Ugalde, Jagath Gunawaredena, Francis Gurry, John Herity, Sarah Hernandez, Timothy Hodges, Olivier Jalvert, Ted James, Nancy Kgengenyane, Richard Kjeldgaard, Bernard LeBuanec, Robert Lettington, Ikechi Mgbeoji, Phyllida Middlemiss, Gerald Moore, Valerie Normand, Dan Ogalla, Maria Julia Oliva, Alberto Parenti, François Pythoud, Preeti Ramdasi, Manuel Ruiz, Sezanneh M. Seymour, Clive Stannard, Caroline Strulik, Seizo Sumida, Antony Taubman, and Morten Walløe Tvedt.

We are also grateful to the numerous commercial, academic, and other persons and entities who shared contractual examples, models, forms, and other information about the 'true-life' use of contracts in ABS.

Acronyms and Short Names

ABS or 'access and benefit-sharing'	'access to genetic resources and equitable sharing of the benefits arising from their utilisation' or 'access and benefit-sharing' as conceived in Articles 1 and 15 of the CBD
AHWG-ABS or **'Working Group'**	CBD Ad-hoc Open-ended Working Group on Access and Benefit Sharing
Bonn Guidelines	Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising Out of Their Utilization (2002)
Cartagena Protocol	Cartagena Protocol on Biosafety to the Convention on Biological Diversity (Nairobi, 2000)
CBD	Convention on Biological Diversity (Rio, 1992)
CHM	Clearinghouse Mechanism of the CBD
CNA	competent national authority (on ABS matters, unless otherwise stated)
COP	Conference of the Parties (of the CBD unless stated otherwise)
DNA	deoxyribonucleic acid
GEF	Global Environment Facility
IGC	WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture (Rome, 2001)
MAT	Mutually Agreed Terms
MLS	The 'Multilateral System of Access and Benefit-sharing' created under Part IV (Articles 10-1) of the ITPGRFA
MOP	Meeting of the Parties
MTA	Material Transfer Agreement
NFP	National Focal Point[1]
PIC	Prior Informed Consent
SCBD	Secretariat of the Convention on Biological Diversity
SMTA	Standard Material Transfer Agreement, adopted in 2006 by the governing body of the ITPGRFA
TRIPS Agreement	Trade-Related Intellectual Property Rights Agreement

1 Within the CBD, each Contracting Party is expected to designate at least one national CBD focal point. In addition, the Bonn Guidelines recommend that each Party designate a national ABS focal point. If they choose not to identify a separate NFP for ABS, the country's CBD NFP will fill both roles, receiving all ABS related information and inquiries.

UPOV	International Union for the Protection of New Varieties of Plant (Union internationale pour la protection des obtentions végétales)
WIPO	World Intellectual Property Organization
WSSD	World Summit on Sustainable Development (Johannesburg, 2002)
WTO	World Trade Organization

Other Terms Used in Part I

In attempting to discuss ABS issues, the authors of Part I have frequently been stymied by the fact that many terms are used imprecisely. For example, the common mode of discussing ABS relationships is to use three terms 'user,' 'provider country' (or 'country providing genetic resources') and 'country of origin.' These terms are defined in ways which, in many cases, would not be precise enough to enable a court or other legal expert to determine clearly when those terms apply. The authors therefore felt that is appropriate to introduce some clarity into our own terminological choices by spelling out the precise way we are using terms within this book. The usage of the key terms of ABS within this book is therefore set out in the Glossary, found at page 169 and the reader is referred to this Glossary in case of any questions over terminological issues.

Introduction: Inquiring into the Legal and Scientific Implications of Bioprospecting Contracts

There has been a temptation in policy discussions to think of development and the preservation of the environment in antagonistic terms… We have to move away from the limited – and limiting – idea that the environment is basically in conflict with development.

– Professor Amartya Sen[2]

Contracts and contract law are deeply integrated into ABS. To address them, this book is divided into two very separate component parts.

Part I focuses on the creation of ABS contracts, with particular attention to the factors and issues which cause such contracts to be very different from other types of contracts. Its goal is to provide a unified starting point from which those whose primary expertise is in commercial and contractual law and practice can gain an understanding of the ABS concept and the special concerns of contracts for genetic resources. At the same time Part I should allow ABS experts and bioprospectors to gain some insight into contract law and the reasons that ABS contracts adopted have later been discovered to be legally flawed and un-implementable as commercial instruments. Besides the difference, Part I also notes certain similarities which exist between ABS contracts and commercial contracts used in other fields.

The authors do not wish to suggest that a contract that does not meet basic legal standards is not valid. So long as there is good will among the parties to a contract, it does not matter whether its provisions are legally enforceable or not. In the current climate of uncertainty and in some cases distrust between providers of genetic resources and various types of users, however, it is important for all parties to find a way of clarifying the meaning and requirements of their contracts and ensuring that those documents are legally valid. Such certainty will enable all parties to avoid misunderstandings, litigation and other conflict.

Chapters 1 and 2 seek to provide a basis for approaching these two aspects of ABS in an integrated way. In Chapter 3, a more immediately practical discussion uses examples from a collection of actual ABS contracts, to provide some ideas for negotiators regarding some of the options available to them. While it does not attempt to identify 'best practices' or provide some standard or model for negotiation, Chapter 3 is offered in the hope that negotiations will be improved by a broader knowledge of the provisions actually being used.

Part I offers an analysis of, and lessons learned from, a wide range of existing ABS contracts and seeks to present these lessons in systematic form according to clearly defined categories of contractual issues which have been customized according to their relevance for ABS contracts.

Following this analysis *Part II* (Chapters 4-7) begins the books attempt to provide a better understanding of many of the possible scientific bases on which ABS contracts may be built. In this part, the objective was satisfied through first-hand accounts. In early 2005, key scientists and lawyers from three organizations involved in bioprospecting practices were asked to develop three in-depth reports (Chapters 5 through 7) about scientific issues associated with bioprospecting contracts. Specific issues that all of the experts were asked to discuss included:

2 Address to the 22d UNEP Governing Council, February 2003.

- Current science and technology applied by their organization and the manner in which this technology may influence the contract negotiation process.

- Uses of microorganism, molecules, genes, and other substances identified by their organization in the context of bioprospecting agreements.

- The impact that these scientific options upon contractual negotiating strategies and contents.

Chapter 4 provides an overview of science and technology in the context of bioprospecting projects implemented since the CBD came into force and presents a comparative analysis of key.

Finally, we note that this book includes statements and opinions from numerous different authors, which are not in all cases shared by all. In all cases, we agree that the most important aspect of this work is its ability to provide critical information of value to all parties and other stakeholders, and sincerely hope that it has done so.

Shakeel Bhatti
Santiago Carrizosa
Patrick McGuire
Tomme Young

June 2009

Part I

ABS Contracts and Contract Law

The Convention on Biological Diversity (CBD)[1] has been described as everything from 'the key document regarding sustainable development' to 'a display of all the reasons why UN effort to conserve the environment rarely succeed.'[2] This divergence seems relatively minor when compared to the level of divergence displayed in CBD discussions of Article 15 and the other concepts linked together under the sobriquet 'access to genetic resources and equitable sharing of the benefits arising from their use' (usually shortened to 'access and benefit-sharing' or 'ABS.')

From the earliest negotiations, the ABS issue engendered controversy. While the negotiations for the CBD began from a conservation objective, the third objective of equitable benefit-sharing was added as an integral part of the Convention. This basic objective focuses on equity and the need to address the possibility that the relationship between developed and developing countries might be inequitable, rather than on 'strict' conservation and environmental concerns. In addition, it uses commercial concepts as its tool for achieving equity. Specifically, it directly focuses on the companies, researchers, and industries that are increasingly applying technologies that *use* the unique properties of biological resources, but do not need to purchase bulk quantities of specimens from the source country in order to do so.[3] As a result of this technological evolution, developing countries' ability to directly reap benefits from those that use their 'biological resources' (i.e., to sell those resources in bulk) is diminishing. A commercial developer or researcher might obtain immense value by utilizing the unique properties of a particular species, subspecies, or variety, having only taken (either with or without payment) a very small number or volume of samples or extracts of the species. The resulting new commercial paradigm would separate the developing country from obtaining value from the species, without enabling them to share in the new market, whether financially, technologically, or developmentally.

While the existence of these activities and commercial evolutions was undisputed, there was dispute from the beginning of the CBD negotiations as to whether they create inequity. One of the roots of this controversy lies in a very simple question – *why is ABS created under the CBD, rather than a trade or commercial regime?* The answer to this question helps to clarify the equity question. The CBD was intended to address the growing difficulties with preservation of the 'green web' of life on Planet Earth. Its first goal (both in time and as expressed in the final instrument) was and is conservation of biological resources and especially of the diversity among them – a quality that is essential for the continued health and existence of life on earth.

Second, it sought/seeks to ensure that human utilisation of the world's biological resources is 'sustainable.' This second objective is essential both for conservation and for the creation of resource-dependent enterprises and societies. Communities and countries that develop on the basis of their biological wealth risk catastrophe if that wealth should disappear. Hence, it is essential to them, as well as to planetary conservation principles that biological resources should be used sustainably.

Consequently, the justification of the CBD's benefit-sharing provision was not solely based on commercial

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1 Rio, 1992, entry into force, 1993.

2 First quote from Report of the fifth Norway-UN Conference on Biodiversity, (Trondheim, 2007); second from Oxley, A., 'Green Gold and Cargo Cults', *TCS Daily*, 29 March 2006.

3 In general, these activities are thought of as 'utilization of genetic resources,' however, it is not clear what specific role 'genes' must play in the utilisation. Many activities that have been assailed or announced as the 'utilisation of genetic resources' have involved a range of different types of activities that are not specifically utilizing *genetic* research (such as the synthetic replication of *biochemical* formulas for use in further research and development). Similarly a number of conventional agricultural development activities (such as seed propagation and new variety development), and even activities that do not involve any replication at all (such as the direct use of naturally collected essences that have been purchased in bulk in the source country) have sometimes been considered to be 'utilization of genetic resources'. *See*, e.g., Mgbeoji, 2006b; and Laird and Ten Kate, *et al.*, 1998 (and other case studies posted on the CBD website at http://www.cbd.int/abs/cs.shtml).

equity. Negotiators and other commentators assumed that ABS would operate as an incentive to conservation. Since the opening of negotiations, the scope and effectiveness of ABS to realistically address these inequities and to provide a functional incentive to conserve biodiversity and to use it sustainably has often been questioned.

The third objective was both last to be developed and most controversial. It was intended to recognise two critical facts: First, that conservation is a difficult burden when it prevents the conserver from obtaining reasonable value and return on the resource being conserved. Second, that the above-described evolution in the use of biological resource has resulted in a diminishing incentive (or even a disincentive) for developing countries (stewards of a large share of the world's biodiversity) to grant access to their biological largesse.

Stated directly, ABS was expected to be a *quid pro quo* of the Convention. Developing countries were generally unwilling to make another international commitment to conservation at the request of more developed countries, without some reciprocal benefit to them. Ultimately, the bargain was successful – ABS was adopted as part of the CBD and the overwhelming majority of developing countries signed and later ratified it.

The contractual challenge

Unfortunately, the initial *quid pro quo* was only part of the ABS challenge. Developed countries, already burdened with significant international financial obligations, were beginning to express an unwillingness to increase those burdens, even where issues of environment were at stake. In particular, they were not willing to commit to resolve these inequities through direct assistance and other intergovernmental mechanisms, or to assume financial responsibility for the equitable sharing. Hence, another important compromise was also built into the ABS process, and continues to be important today. Specifically, the ABS concept was based on strongly stated assumptions that the private sector – the 'users of genetic resources' (a term that is often used but as yet ambiguously defined) – would bear the primary burden of benefit sharing. Most important, although not expressed in documents, it was broadly assumed and stated that *contractual mechanisms* would be the vehicle for this sharing.[4] Given this historical genealogy and these tacit assumptions, the law of contract assumes a role which is central to the implementation of ABS under the CBD, but which has not been explicitly stated in the Convention.

Starting from these statements and assumptions, some companies, countries, communities, and individuals took the initiative of attempting to negotiate ABS contracts and to adopt basic legislation and other practices regarding 'access to genetic resources.' These early ABS systems were based on the assumption that each country can control all 'access' to its own genetic resources, and that it can require 'benefit-sharing' as a prerequisite to release of that control. In other words, they assumed that one could not gain access to or 'utilize' genetic resources without first obtaining an ABS contract. Over the years, many deficiencies have been found in this ABS paradigm – particularly the idea that existing contractual practices, coupled with 'source country' legislation would be a sufficient functional basis for 'control' of access to genetic resources and traditional knowledge.

The 'contractual side' of the international ABS negotiations and implementation

At this writing, negotiations are ongoing to clarify and improve the functionality of the international regime on ABS.[5] While some participants are proposing that sectoral Material Transfer Agreements (MTAs) would bring an increased use of contract mechanism, others are recognizing that new legislation and practices are needed to enable all ABS contracts (standard or non-standard) to function effectively and to ensure that the regime eq-

4 *See*, e.g., Report of the International Negotiating Committee, and International Committee for the CBD (ICCBD), as well as Glowka, 1998 at 80, and Ten Kate and Laird, *et al.*, 1999, throughout.

5 The current status of the 'international ABS regime' negotiations is reported in the (regularly updated) ABS pages of the CBD's website at http://www.cbd.int/

uitably addresses the needs of both the provider and the user.

For a variety of reasons, the application of contract law and practice to ABS has not yet been the subject of in-depth legal analysis or commentary. Most authors who have considered the legislative and commercial law aspects of ABS have been writing at the theoretical level rather than on the basis of practical legal research into commercial law issues. For example, early national ABS legislation was later in some cases described as 'an experiment in ABS implementation.'[6] Such legislation often did not address or coordinate with national contractual principles, much less the more difficult problems of international contractual law described in this book.

In this legal ambience, many existing legal works on ABS address the relevance of contract law often with only a few sentences, indicating three key perceptions:

- contract law is relatively simple,
- although used in ABS, contract laws are unaffected by the uniqueness of ABS, and
- therefore there is no need to study or consider contractual legal and practical issues in the course of ABS implementation or even ABS contractual negotiations.

In fact, however, the law of contracts is complex and highly relevant to ABS. Many factors relating to ABS make it very difficult to apply contract law easily or simply. Attempts to determine and apply contract law to ABS have long been recognized as quite complex by experts working in natural resource industries and related commercial sectors, such as forestry, agriculture, and fisheries.[7] Consequently, the government officials and legal experts who have actually applied relevant commercial law to ABS contracts in non-theoretical situations (i.e., 'in real life') generally disagree with the 'ABS expert' view that the contractual and legal concerns of ABS are relatively simple and few.

Organisation of Part I

In Part I, this book attempts to provide some insight into the application of contractual and commercial law to ABS. Part I begins with a discussion of some of the

- components of ABS relationships and factors relevant to how they are negotiated and documented (Chapter 1) and
- areas in which ABS processes, systems, and documents raise substantive challenges and other questions under contract law that have not been answered as yet, either in legislation or by judicial decisions (Chapter 2).

Following this background, Chapter 3 focuses on particular examples, providing

- advice regarding the advantages and disadvantages of the development, use, and reliance on model contracts, form contracts, and specimen provisions from other contracts, Chapter 3, and
- actual ABS examples (contracts in force, contracts negotiated, form contracts, and model contracts), as described below.

Part I is intended to assist negotiators in preparing and discussing ABS contracts and related instruments affecting those relationships.

6 This comment was most often made by technical assistance providers involved in the negotiations of the Philippines' Executive Order 247, which continues to have functional problems arising from the original system design. Benevidez, 2004.

7 Young, 1994.

Contents, methodology and sources used in Part I

In undertaking this task, the authors have drawn on a wide range of sources of contracts and other legal instruments, studies, and databases, including the WIPO Contracts Database, as a source of real-life contracts and other ABS instruments. The authors' interpretation of contractual issues has been based on a number of general sources discussing contractual law under various legal systems, supported by the authors' own experience with contractual negotiations and the application of contractual and commercial law, both in the ABS context and more generally.

The compilation and completion of the chapters was aided by the existence of the WIPO Contracts Database,[8] compiled by the Genetic Resources, Biotechnology, and Traditional Knowledge Section of WIPO. The Database contains over 30 contracts and other legal instruments, both models and examples, whose authors or parties have allowed these instruments to be made publicly available. As noted in chapter 3, only a portion of these instruments are actually 'ABS Contracts' – that is, contracts between users from one country and a provider from a different source country (or the source country itself). The remainder consist primarily of 'post-access' contracts, transferring rights and resources between the user and other researchers, distributors, or licensees/developers. Although this latter group of contracts are not specifically examples of user-provider relationships in the narrow sense of the term as defined in an ABS context, they provide important examples which can enlighten contractual practices and terminology in the primary negotiations between users and providers as well.

The WIPO Contracts Database represents only a part of the collection of contracts used in this Part. Other contract examples which have not been redacted and/or approved for public release were also used. Specific elements have been excerpted from both public and non-public contracts within that collection and provided here as tables showing a variety of actual current approaches to particular issues or contractual requirements. In addition, the book utilizes other examples and information, obtained through interviews and other personal communications, regarding which they are similarly bound by commitments of confidentiality, although permitted to publish redacted excerpts. In order to ensure protection of the various parties who have submitted confidential information to the authors, no information about the parties or sources of any of the contracts discussed are provided. Consequently, these tables do not include the names of particular parties or other details that would allow the reader to identify a provision as being part of a particular contract. Where possible, the actual wording and material from actual contracts has been used, with indications to note where the instrument being used is a 'model' or 'form'.[9]

The authors are happy to note that the WIPO Contracts Database will continue to be updated, and to provide parties with a basis for analyses of current practices and provisions in ABS agreements and contracts for the use of traditional knowledge. Further information is available by contacting the Genetic Resources, Biotechnology, and Traditional Knowledge Section of WIPO directly at the contact address given in the WIPO Contracts Database.

Most importantly, the Database is an important contribution to promoting the functionality of ABS, and its transparency, and might over time become a reflection of the evolution of ABS practices. ABS has existed for a very short time relative to most legal concepts, and in many ways it is not parallel to any other existing legal or commercial system. Consequently, it is important to build a body of practical experience and knowledge of the provisions and practices being used to apply the ABS concept. This will enable both sides of an ABS transaction to know better what to expect and what their rights are within those relationships. In addition, transparency provides a useful base of information for those trying to produce legislation and/or to negotiate a future instrument addressing the utilisation of genetic resources and

8 Available online at http://www.wipo.int/tk/en/databases/contracts/index.html

9 Where only an excerpt of a provision has been used, we have endeavoured to provide sufficient information to enable the reader to understand the context of the excerpt.

traditional knowledge. Finally, a broader understanding of how actual ABS contracts function is critical to the system, enabling all stakeholders to evaluate the success of ABS in achieving the objectives and of the CBD. Consequently, parties to ABS agreements and related instruments are encouraged to continue providing copies of those documents to the WIPO Contracts Database and similar initiatives.

Other examples

In addition, many specific issues or experiences are discussed in detail in Part II of this book. Those examples are provided with all respect and gratitude to the countries and projects described in those chapters and case studies.

Other sources of relevant law

To achieve its purposes, this Part cannot focus solely on this small range of existing ABS contracts, none of which have been legally interpreted by a court or governmental body. It must look to the elements of law that are both primary and essential. In the commercial world, very few contractual fields are governed entirely by specialized law of their particular type of contract. Even concepts such as intellectual property rights (IPRs), although governed by a large body of detailed and specialized statutes and regulations, are also directly subject to contract law and to laws that govern the legal and commercial rights of the parties (property ownership, anti-trust, unjust enrichment, national 'organic' instruments, sovereign rights and many other matters). In addition, the body of practical knowledge and analysis of ABS extends well beyond the few available contracts.

Commercial law and analysis

A critical source of this work is the long-established law and analysis of the law of contract formation, implementation and enforcement, which is heavily linked to commercial, procedural and organic laws, including legal systems governing intellectual property rights, trade, anti-trust and other commercial issues. The complexity of this body of law is significantly increased in trans-border contracts where any contract question may be governed by the laws of two or more countries in various situations.

In any country, the law libraries will contain thousands of books addressing contracts and commercial law, including both those which provide the specific elements and decisions of the country's own law and those which describe these issues in comparison with other countries and systems. Analytical works on any sub-area of contract law, limited to any one country or legal system will, in that country, be many times the length of the current book. Beyond this, one must also consider the nascent body of private and public international law addressing these issues. Once a contract is 'international', the amount of relevant legal material that must be examined increases. In the words of one of the most respected legal compendiums:

> *Of all areas of law, perhaps none has been subjected to comparative study as consistently, frequently and intensely as contract law. The International Encyclopaedia of Comparative Law devotes two out of seventeen volumes to the subject of contract law, and contract law takes up more than half of the subject matter in [another basic compendium]. It is by far the most prominent topic in international debates about private law.*[10]

International principles generally rely on national law of one or more countries, so that they may be understood only by considering national contract law in detail.

Two other critical sources of research data and analytical material are case law (judicial decisions) and case studies (analyses of how a particular contract worked in real life). Both are essential elements of any legitimate advice or analysis in contract law and practice. In many countries, the past decisions by judges regarding a partic-

10 Reinmann and Zimmermann, 2006, at 900.

ular law or legal principle have a defining role, with prior court decisions becoming part of the legal requirements imposed on each party to a new or ongoing contract. This approach, incorporating 'judicial law' or 'precedent' into a single seamless body of national law of contracts, is normally associated with 'common law' legal systems. However, companies in nearly all countries study how judges and other decision-makers are applying contract law and terms of specific contracts. It is the basis on which they build their expectations, and negotiate contracts that are commercially reasonable and enforceable.[11] The cumulative impact of business practices within a given sector or industry may eventually come to be accepted as *de facto* legal standards.[12] Especially in the years before such standards are recognized, it is important to be broadly aware of provisions that are being negotiated and how they are applied and implemented.

ABS law and analysis

A second basis for this Part is found in legal and policy work under the CBD and ITPGRFA. The authors note the existence of literally hundreds (at least) of different articles, books, and discussions on ABS, ABS transactions, and related matters such as IPRs in GR and TK. While some of these specifically address some contract law matters, most do not, although they may raise issues, objectives, and concerns of great relevance to the contents, interpretation, implementation, and enforcement of ABS Contracts.

Merging commercial and ABS legal concepts

Obviously, all of the data in the two fields cannot be amalgamated in this section. Instead, the intent is to provide a basis for integrating these two large bodies of legal literature ('contract law' and 'ABS legal issues'), which differ in one very serious respect. Contract law is long-established and based on a process of development, scholarship, detail, and accuracy. It addresses known relationships and has evolved out of practical application through many centuries. By contrast, ABS consists primarily of policy-type documents and a very limited body of relatively new and untested legal instruments – the CBD, ITPGRFA, Bonn Guidelines, and a small number of national ABS laws and policy documents. ABS legal work has focused on an entirely different set of legal issues and principles, relating to national implementation, policy- and equity-based objectives and the practical questions of how a new international system can be created.

To date, there has been relatively little crossover between contractual and ABS expertises even when writing about the intersection of these two specialties. This lack of integration has proven problematic where companies and source countries attempt to apply ABS principles to create legally certain and enforceable contracts.

Although Part I is an attempt to inform contractual/commercial specialists about ABS and the ABS specialist about contracts, it is not intended as a treatise on either issue. Its more modest expectation is simply to provide a unifying summary, at a level that will be useful to both lawyers and non-lawyers. It is designed to be used in practice, rather than studied by legal theorists. To this end, the authors have attempted to avoid legalese and tried to keep discussions of difficult issues of law relatively short and focused. In some cases, references to sources of more detailed discussion have been provided or particular legal issues that might be studied to shed more light on the legal details of the concept have been identified.

Generalising about national laws

In discussing these complexities, one must be careful because many points which are considered 'obvious' or 'unchallengeable' in one country's contract law will not exist in another country's system. Unfortunately, it was not possible, within the time available for researching and writing this book, to deeply research all of the contractual issues, questions, problems and situations that arise in the ABS context in all legal systems. In the end, some of the issues were difficult to analyse in even one system.[13] While recognizing that there are numerous differences among national legal systems and international codes, as well as many points of similarity, this book does

11 *See*, e.g., Visser 't Hooft, 2002, at 25, citing recent studies in Japan, considering the disposition of 114 court cases on commercial contract disputes.

12 *See* Visser 't Hooft, 2002, noting that Japanese law specifically authorizes or requires the recognition of customs within the relevant industry, as a means of determining the meaning and validity of contracts.

13 It is notable that the authors come from different legal backgrounds. Both have worked extensively with many different legal systems, writing and advising on legislation, contractual negotiations, and legal advocacy, in over 100 countries, as well as facilitating or participating in international tribunals and arbitration. This experience has colored their understandings of the issues described in this Part.

not (cannot) inquire in detail into the underlying legal issues in any single country. When used in any transaction, this book should probably be supplemented by speaking with legal experts with substantial contract law experience and knowledge of legal issues and practices in the countries involved in that transaction.

Integrating cultural factors

Finally (and perhaps most important), throughout Part I, it will be most important to remember that contracts are one of the key areas in which the law interfaces with cultural factors in determining how commercial and regulatory systems actually function.

Every legal system needs to be understood in its own cultural, economic and political context. Even if black-letter law[14] as expressed in legislation and caselaw may turn out to be quite similar (between various countries' legal systems), the political and cultural context of the law, such as the provisions for dispute resolution and people's attitudes to the law, may lead to a divergence rather than a convergence of actual living law.[15]

This statement is equally true between countries within the same region or sharing a common type of legal system (i.e., between two common law countries or between two civil law countries, for example) as between those with completely divergent systems. In fact, countries with the most in common, legally, will often be so different, in cultural and geographic terms, that their practical needs and implementation of ABS will be entirely different in some ways.[16]

Part I is backed by extensive research in international/comparative law and in national law to the extent available to us. It was not possible in the space available to provide a detailed account of all relevant research. The authors hope and believe that the most immediate need in ABS contracts is not for a detailed legal tome, but for an analysis that can help guide parties negotiating ABS Contracts and those advising them.

14 A legal colloquialism, referring to written law as distinguished from the way that the law works.

15 Visser 't Hooft, W., 2002, at 15.

16 *Id.,* identifying significant similarities between the legal systems of Japan and the Netherlands with regard to contracts.

1 A Contractual View of ABS

Shakeel Bhatti and Tomme Rosanne Young***

Dating from the CBD negotiations, it has been frequently stated that ABS would be implemented by contracts between the user (individual or entity) and the source country (and/or the private provider where national law gives private individuals or entities the right to contract as providers of genetic resources.) The intention of the persons making these statements was to support their claim that ABS would operate on the basis of an existing legal system, so that countries would not have to create detailed national ABS provisions, nor would any system be needed in the CBD. These statements grew more emphatic as the deadline for adoption of CBD approached with the parties still unable to agree on clear statements about how ABS would function.

In order to rely on contract law, however, CBD negotiators and advisors made several additional assumptions. First, they specifically stated that questions of 'ownership of genetic resources would be decided under national law of property,'[1] assuming that existing property law in all countries would be sufficient to address these matters. Second, they assumed that it would be possible for all countries to control the access to and use of genetic resources – to detect access and prevent use of genetic resources, unless it was based on a contract. Finally, they assumed that, despite the significant lack of agreement among the countries regarding what ABS would do and require, it would be possible for the courts to apply and enforce ABS contracts in transborder (multi-country) transactions without any special adjustment to existing international law and practice. As discussed in the next section, however, none of these assumptions was ultimately true.

This chapter cannot provide a complete or detailed summary of the ABS system and processes. The authors presume that any readers needing such a description will turn to other sources, including the other books in the ABS Series, as well as numerous publications, case studies, and other documents available through the CBD-CHM,[2] the ITPGRFA website,[3] and elsewhere. Instead, this chapter will provide a 'contractual perspective' of ABS, discussing

- the challenges and obstacles that indicate that contractual negotiators need to investigate ABS issues more closely;
- the CBD provisions most relevant to ABS contracts;
- how ABS contracts fit within the ABS system;
- two of the most important international instruments which have sought to clarify and simplify ABS contractual discussions (the Bonn Guidelines and the SMTA of the ITPGRFA); and
- obstacles and disconnections which are currently impacting the role of contracts in the negotiation, implementation, and enforcement of ABS contracts.

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* The specific statements and contents of this chapter do not necessarily reflect the opinions of the World Intellectual Property Organisation, its Secretariat or Member States, nor the IUCN, with which he was affiliated during the writing of this chapter, nor those of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture, its Secretariat or its Contracting Parties, with which he has become closely affiliated in the interim between writing and publication of this book.

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1 Glowka, *et al.*, 1994, at 76.

2 www.cbd.int/chm

3 www.planttreaty.org

1.1 Basic obstacles of ABS as a functional regime

The current gaps and ambiguities in the ABS concept have existed since the CBD's adoption. This is one of the main reasons that new international negotiations have commenced regarding ABS. This book is not aimed at remedying those gaps and obstacles, or at advising or predicting the outcome of those negotiations. Rather its goal is assisting countries and users who are today negotiating ABS contracts, licenses, and permits, under the current legislative and political systems. Given that most contract parties engage in that work without first studying the ABS issue, it seems appropriate to summarize some of the conceptual obstacles that are most directly relevant to ABS contracts, before beginning a more systematic examination of those issues.

1.1.1 Regime gaps and inconsistencies affecting ABS contracts

The heart of the problems facing ABS implementation arise from the fact that there is little legislation implementing ABS at the national level, and most of it is not functioning effectively. Although a few countries have adopted legislative systems for granting permits to use their own genetic resources, none has yet complied with the CBD's requirements regarding user measures[4] – measures applicable to the users under their jurisdiction when they utilize genetic resources of foreign origin. [5]

Even from the provider side, at the time that the CBD was adopted (and still today) no country had adopted a workable system for identification of ownership of genetic resources.[6] Although the definitions are contested, 'genetic resources' can be found in and derived from virtually any biological material. Consequently, it is normally not possible to control or track the physical ability to obtain (and thereafter test) samples, unless either (i) the users voluntarily provide the relevant information and agree to these controls, or (ii) both source and user countries (and other countries in which the *biological* material has been held) are willing and able to oversee all potential utilization activities involving genetic resources derived from any biological material.[7]

It is still unclear whether either challenge *must* be addressed under the CBD. It remains true that many parties to the current ABS negotiations expect users and user countries to 'control' the utilization of all genetic resources of foreign origin. This approach appears to assume that any person/entity whose products are based on genetic information from species not endemic to the user country are by definition potentially engaging in 'misappropriation of genetic resources' regardless of

4 'User measures' is the common way to refer to the obligations under CBD Art. 15.7. Most relevantly, it requires that 'each Contracting Party shall take legislative, administrative or policy measures, … with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources ….' A few countries have adopted laws calling for the disclosure in patent applications of the origin or source of genetic resources used in the invention/innovation. However, as a study by the Spanish patent office indicated, until recently most disclosures have been voluntary – offered by patent applicants. Such disclosure has usually been contained within the description of the invention (in the patent application). Even in those countries with mandatory disclosure requirements, those requirements could theoretically be a basis for refusal to grant a patent. Once the patent is granted, they rarely affect the validity of the patent, and do not create any obligation (or incentive) to share benefits with the provider of the genetic resources.

5 There are many possible reasons for Parties' poor Article 15 performance to date. National legislative draftsmen generally find it very difficult to create legislation that implements ABS due to the ambiguities and uncertainties regarding the practical meaning of Article 15. Standard examples of ambiguity include the impenetrability of the terms 'genetic resources' and 'utilization of genetic resources,' as well as the uncertainty regarding the meaning of 'access' and its relationship to the obligation to share benefits. These points are considered in more detail in Cabrera and Lopez, 2007 at 1.2 and 2.1.3, and Tvedt and Young, 2007 at Chapter 2.

6 At least one country, Australia, has legislated in a way that indicates that any person that owns or possesses as specimen of biological origin also owns the rights to genetic resources it contains. *See* AUSTRALIA, Environment Protection and Conservation Regulations, 2000, Statutory Rules 2000 Nº 181, as amended (taking into account amendments up to SLI 2006 Nº 131, Parts 8A, 9, 10, and 17). *And see*, Queensland Biodiscovery Act, Act Nº 19, 24 Aug 2004; and other documents available on the CBD's ABS Measures database. http://www.cbd.int/abs/measures.shtml. This provision, however, appears to be inconsistent with the Australian law on patents, which apparently recognizes the right to patent naturally occurring genes without getting permission from the owners of rights in that material. Consequently, although having espoused this approach to ownership of genetic resources, it cannot be said that Australia has integrated that approach into its property/commercial law.

7 Even if all future movement of biological material from the source country can be controlled, this may not enable any actual control of the 'utilization' of genetic resources from that material. Various aspects of the proposals for control or tracking of access and utilization of genetic resources are discussed in detail in Ruiz and Lapeña, 2007, Book 3 in this Series. This separation between benefit-sharing and control is equally true for traditional knowledge, where widespread dispersion of such knowledge among communities and often among community members makes it difficult to condition benefit-sharing on control of even the most sacred or secret species-related knowledge.

the conditions under which the resources or information was acquired, unless the user previously obtained ABS permission from the country of origin.[8] By contrast, most *users* feel that ABS responsibilities apply only where the user specifically obtained the resource from the source country directly – i.e., by engaging in direct bioprospecting under a permit.[9] They appear to feel that, if the material is acquired from another collector, it is not covered by ABS. This approach appears to create a significant 'loophole.'[10]

From the most basic legal perspective, it is not yet even clear what *kind* of property genetic resources might be. This determination would be critical to any attempt to deal with genetic resources as 'property' under national law, given that in virtually all countries the rules governing ownership of land and permanently constructed improvements are very different from those governing ownership of other types of property, such as movable property, common property, sovereign property, patrimony, 'intellectual property' and other kinds of 'intangible property'. Within these categories, there are often dozens of more specialized categories which again are subject to unique rules, including rules determining who may own (or have rights to control) them, how ownership is obtained and what limits or duties apply to owners.

There is no 'standard' way of addressing property rights, even within a single country.[11] For a person or company attempting to acquire rights in genetic resources, however, this uncertainty becomes an even more considerable problem, embodying both the new problem of determining what a 'genetic resource' is in any of the countries involved and the age-old challenge of trying to address property issues across multiple national jurisdictions. Contract provisions and rights may differ markedly depending on which category of property is under discussion. In the area of ABS, however, it is very difficult to determine what category of property genetic resources are. There is no single view among countries regarding what kind of 'property right' is involved. Often, it is difficult to answer this question even for a single country.[12] Each country divides resources among these categories differently, and allocates rights and duties of ownership differently. [13] Researching this legal question in each country is a time-consuming process which no one has yet undertaken. Proceeding to contract without an answer, however, is a major source of legal uncertainty in ABS contracts.[14]

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8 At the time of writing of this book, the CBD Working Group on Access and Benefit-sharing had just begun to consider proposals for developing a formal definition of the meaning of the term 'misappropriation' in respect of genetic resources. The above-mentioned view is most apparent when reviewing the claims of 'misappropriation' and biopiracy that have been leveled up to now. *See* Young, 2005.

9 *See* Holm-Müller *et al.*, 2005; Latorre, 2005; Frison and Dedeurwaerdare, 2006. At minimum, results of recent 'user surveys' indicate that most users do not know or particularly care what the ABS provisions require, assuming that they are exempt, so long as they acquire genetic resources through secondary sources (collections, collectors and middlemen) outside the source country.

10 A representative of the pharmaceutical industry specifically stated that in future, to avoid ABS complications he would always acquire his genetic material from other collectors, both those who have recently collected the materials and botanic gardens whose collections include foreign-collected materials and their progeny. Presentation of T. Henkel, 'A Perspective from Pharmaceutical Industry,' Presentation to *High-level Experts Meeting - Addressing the Access and Benefit-Sharing (ABS) Challenges in the Context of the Convention on Biological Diversity* (Tokyo, 8-9 February 2007) and other remarks in that meeting

11 The sovereign right of countries over their natural resources has been generally recognized for many decades. Mgbeoji, 2001.2006a. Prior to 1992, however, no legal instrument suggested that there was any kind of commercial right of any person or country to exert dominion, ownership, or other legal rights in the genetic information or other characteristics of any naturally occurring species or variety of plant, animal, or other element the biota.

12 There are many different views, with some analysts likening genetic resources to intellectual property, and other commentators assuming that they are governed by each country's existing 'real property' (land and buildings) law. Neither claim is generally supported by current practices. In late 2007, the SCBD began to examine this question, with an initial study that appears to have focused on the latter view, assuming that national land law would be the basis for ownership of genetic resources. 'Report on the Legal Status of Genetic Resources in National Law, Including Property Law, Where Applicable, in a Selection of Countries' UNEP/CBD/WG-ABS/5/5, 30 August 2007. Although it did not consider national law governing, for example, crops, movable property, intellectual property, common property, intangible property or national patrimony (the types of property law that appear more directly relevant to genetic resources), it provides a first step towards understanding the property question. Further inquiry seems essential on these points.

13 This issue is at this writing still in need of comprehensive analysis. Unfortunately, *The ABS Series* was not able to include this type of study within the current list of five books.

14 This primary deficiency connects to a second critical element preventing ABS implementation – the fact that ABS is a multi-country process. Every ABS transaction under Article 15 involves at least two different countries – the 'country providing the resources' (herein the 'source country') and the country with jurisdiction over the user. There may be more countries involved, since a particular transaction may involve resources from multiple source counties, users operating in more than one country and/or a variety of 'middlemen.' Given that all countries are specifically obligated in the CBD to adopt measures relevant to users in their country, ABS implementation might create a legislative nightmare in which at least two (and

Finally, the question of ABS enforcement is intensely difficult. ABS laws and negotiations have still not found answers to straightforward questions such as what actions are illegal and how they are documented, in 15 years of trying.[15] It is important to remember, that contracts can provide legal certainty and clarify the rights and duties of the contracting parties *only* where the contract terms are unambiguous and mutually agreed. For a private contract to be fully 'binding,' it must be 'enforceable', in cases of disagreement between its parties. This can create difficulties in the ABS context, where many basic components of the contractual system are un-agreed, indistinct or vague, since courts and government agencies normally will not even attempt to enforce contracts that are ambiguous. This is not a choice on their part – it is mandatory. It is impossible to apply the rules of law to achieve reproducible results, when primary facts cannot be pinned down.

Consequently, it is the ABS ambiguities, as discussed above, that have generally prevented parties from asserting ABS claims in courts. The result ultimately is that such claims are tried in 'the court of public opinion' (the press, the internet and other forums) resulting in negative publicity for the entire ABS concept, harms to users and no remedy for providers, without ultimately providing any lessons-learned on which to build a constructive and legally supportable way forward. This creates a spiral of increasing distrust, more administrative requirements (in an attempt to make the ABS responsibilities stronger and more binding) and, often, increased transaction costs and longer processing time in obtaining the rights to use genetic resources. ABS provisions generally require that source countries can only receive benefits if users achieve results, or patent or market new products.

All of this leads to a basic truth known to all lawyers, government administrators, and commercial entities: If a system is non-functional or imposes insurmountable obstacles to the Parties, it does not matter what the system says – nobody will use it. No sector will be served if the ABS system becomes unusable or so unwieldy that is discourages or prevents users from seeking ABS through contractual or other instruments.

1.1.2 Integrating ABS commercial elements with environmental and social purposes

Although the ABS concept employs elements from both IPR and more conventional types of property, it is rather clearly an entirely new kind of legal or property regime. As such, it will need to be based on a new framework – one which addresses the unique nature of ABS. In addition to the need for legal consistency of that framework, however, its nature and provisions will depend in large part on the objectives of ABS. This is an element of the ABS concept which has not yet been well recognized by many sectors and actors.

For example, the common approach for the commercial sector, in considering ABS is to evaluate its purpose and value in commercial terms. Consequently, some commentators have focused on the fact that few countries report having received a significant amount of benefit from ABS and the fact that the ABS regime was not necessary from a user perspective – i.e., that utilization of genetic resources was entirely possible before the ABS concept was created. And indeed, it is indisputable that the ABS idea would have been abandoned some time ago, if its purposes were solely commercial.

This important conclusion however, does not necessarily imply that ABS is meaningless, but that its meaning is not strictly commercial. According to several commentators, ABS was created to address critical social and environmental objectives of the CBD. In essence, these social and environmental objectives were agreed upon, and then a commercial mechanism was created as a means of implementing and transferring them to the private sector. This was a common approach in international law in the 1990s. In order to create a new international instrument or program, it was necessary to

possibly several) countries' national law must be applied. The multi-national character of ABS creates a problem for implementation because it prevents any country from unilaterally regulating ABS implementation in a way that will apply after the user has left the source country's jurisdiction. This may create a perverse incentive, encouraging users to try to evade source-country ABS requirements. Tvedt and Young at 3.5.3 and 6.2.

15 *See* Young, 2006a. The international regime negotiations are currently considering the possibility of developing an international definition of 'misappropriation of genetic resources' – further evidence that these questions are not entirely answered at present. These factors have been canvassed extensively in other publications, including other books in the current Series, and will not be detailed here.

try to mitigate or minimize the governmental costs of that program. The private sector was identified as the appropriate party to be brought into the framework and to address these responsibilities.

This approach is not new. Most countries' governments pass some part of their social and environmental responsibilities to the commercial sector. Examples include (i) environmental permit requirements by which the government gives business the direct responsibility for environmental actions; (ii) 'social security systems' for workers which are paid in part or in full by the worker's employers; and (iii) special taxes and fees charged only to companies and commercial operations, which fund new social programs.[16] In each of these examples and many others, governments disseminate responsibility for certain socially necessary actions among companies and commercial actors.

It may be easier for users to participate in ABS transactions, if they recognize ABS as simply another such situation – one that has not yet been expressed with legal clarity, and which their participation can help to establish as a reasonable system. Based on the policy rationale of current discussions and negotiations, ABS is understood as a social/environmental program, rather than as a 'new commercial market.' To use an example that has been used in the past and will reappear below, the creation of ABS is very similar to Environmental Impact Assessment (EIA) in several respects.[17] Conversely, however, in developing the ABS regime, it will be necessary for governments to ensure that both provider-side and user-side measures are designed and interlinked in a way that encourages and rewards compliance by both users and provides an integral and positive contribution to their commercial activities.

1.2 Access and benefit-sharing requirements

The ABS concept was created *in the CBD* – it did not exist before 1992.[18] Consequently, it is important to begin this book with Article 15 of the CBD (See Box 1). It is important also to focus this analysis of it on the full Convention, and the points from it that are most relevant to ABS contracts and their implementation.

The ongoing political debates focus primarily on the roles and positions of governments, and are thus of limited interest in this book. They will be included only where they address the primary question – *What are the rights, duties and limits on ABS contracts?* The authors are aware, however, that too narrow a focus on this question could potentially be harmful. Many companies and researchers encounter major ABS problems when they base their activities on the assumption that ABS is simply a permitting process or contractual/financial concept. This perspective creates a conceptual gulf between commercial negotiators (viewing ABS negotiations commercially) and the country/agency/community that is the 'provider' (viewing ABS as either a social-welfare system, or an environmental protection measure, or both).

16 Nearly all countries use all of these mechanisms and many others besides. A partial case-study of the effectiveness of such systems can be found in Cotrell, *et al.*, 2008.

17 This similarity may not be a source of comfort to developers of environmental legislation who recall the intensity of opposition to EIA when it was introduced.

18 The term 'genetic resources' was used to refer to the importance which each country should place on the diversity of different species, subspecies, and varieties within its borders and in the world. This definition of the concept is still reflected in the ITPGRFA (Arts. 2, 5-8 *et passim*).), *see* Tvedt and Young 2007 at 4.1.1.2 and elsewhere.

Box 1 Article 15 of the Convention on Biological Diversity

Article 15. Access to Genetic Resources

1. Recognizing the sovereign rights of States over their natural resources, the authority to determine access to genetic resources rests with the national governments and is subject to national legislation.

2. Each Contracting Party in the CBD ['Contracting Party' refers to countries that have ratified the Convention] shall endeavour to create conditions to facilitate access to genetic resources for environmentally sound uses by other Contracting Parties and not to impose restrictions that run counter to the objectives of this Convention.

3. For the purpose of this Convention, the genetic resources being provided by a Contracting Party, as referred to in this Article and Articles 16 and 19, are only those that are provided by Contracting Parties that are countries of origin of such resources or by the Parties that have acquired the genetic resources in accordance with this Convention.

4. Access, where granted, shall be on mutually agreed terms and subject to the provisions of this Article.

5. Access to genetic resources shall be subject to prior informed consent of the Contracting Party providing such resources, unless otherwise determined by that Party.

6. Each Contracting Party shall endeavour to develop and carry out scientific research based on genetic resources provided by other Contracting Parties with the full participation of, and where possible in, such Contracting Parties.

7. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, and in accordance with Articles 16 and 19 and, where necessary, through the financial mechanism established by Articles 20 and 21 with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources. Such sharing shall be upon mutually agreed terms.

Comprising only seven clauses, Article 15 was the first international binding instrument to address the commercial and non-commercial utilization of 'genetic resources' or recognise them as a type of property or right that can be separately controlled and transferred through national law. Like all other provisions of the Convention, however, Article 15 is not a regulation of private actors. It is instead a series of commitments made by governments, clearly specifying that governmentally adopted measures shall be the mechanism for implementing ABS.[19]

The following sections identify the legal components of Article 15 most relevant to ABS contracts.

1.2.1 Sovereign rights in genetic resources

Clause 15.1 specifically states that each country has full sovereign rights over its genetic resources. This provision reiterates or clarifies CBD Article 3, which specifically recognizes each country's sovereign rights over all of its biodiversity. Although simply stated, these provisions are complex in practice, because

19 The strong implication of Article 15 and the discussions and analysis at the time of the CBD's adoption was that ABS would be implemented through private and public/private contracts and other private commercial and noncommercial actions. This is not stated in the text of Article 15.

- many species move or migrate across national boundaries (so that two or more countries may have temporary sovereign rights in the same *specimen*, at various points in its life) and

- each specimen of a particular species, variety, or subspecies has many of the same 'genetic resources' as all others,[20] so that even where a particular specimen is permanently located in a particular country, its genetic resources may be essentially 'shared' with every other country in which the same species is found.

Logically, then, the only situation in which a single country's law will *undisputedly* decide the ownership of a particular genetic resource will be where the species involved is a 'narrow range endemic' found *in situ* in only one 'country of origin.' Even then the issue of rights to provide or use genetic resources are not clear if more than one owner within the country has the rights of a 'provider' of the genetic resources of that species. These questions can become further complicated, when we remember that in some cases a particular genetic characteristic is shared by *other* varieties or by completely separate species within the same genus or higher taxon.

The legal impact of Article 15.1 has not been completely felt as yet. The concept of 'sovereign rights' over genetic resources clearly refers to more than simply the right to adopt and implement ABS laws. Legally, in addition to its sovereign right to particular genetic resources, the sovereign also has the right to determine how *other* legal regimes within the country apply to genetic resources. For example, at present, each country has the right to adopt its own national patent law.[21] Consequently, each country has a right to decide that it will not grant patents that do not comply with the patentability requirements set out in the country's law. One recently arising area of debate relates to patents of naturally occurring genes, as discussed in 1.2.3, below. This may create inconsistencies between national availability of patents on one hand and the negotiating positions taken by that country with regard to ABS patents.

1.2.2 Scope and coverage of ABS

The scope and coverage of ABS provisions is set by two key points of terminology. First, Article 15's benefit-sharing objective focuses only on the 'utilization' of 'genetic resources.' Second, for each species, subspecies, or variety, national rights to control access and to receive a share of benefits are available only to 'countries of origin' of that species and countries which 'have acquired [its] genetic resource in accordance with the Convention.'

1.2.2.1 'Genetic resources'

Within the CBD, the term 'genetic resources' is only used in reference to the third objective (benefit-sharing and ABS).[22] Thus, the first scoping conclusion is simple – the scope of ABS is limited to 'genetic resources.' Unfortunately this answer necessarily leads to a further question: '*What are genetic resources*?' As noted by several authors,[23] this question is not answered in any effective way within the CBD. The Convention's three linked definitions of 'biological resources,' 'genetic resources', and 'genetic material' indicate an outer boundary of the concept – it is limited to life forms or their parts or extracts. Beyond that, those definitions do not provide clarity or specificity. They do not, for example, provide an objective means of determining the difference between 'genetic resources' and 'biological resources.'[24]

In negotiating any contract, its parties have a strong incentive not to use any term that is unclear. This is because the entire *raison d'etre* of a contract is to create a legal relationship that is clear and understood identically by both parties – to avoid later disagreement to the greatest extent possible. Rather than use an ambiguous term,

20 In general, it appears that research into plants and microbial species focuses on the genetic characteristics shared by all members of the variety or subspecies, while some (but not all) work on species in the animal kingdom is focused on individual variations. This is comparable to agricultural commodities where the year-to-year consistency of plant/crop varieties is much sought-after, where the unique qualities of one prize animal or herd allow the owner to command a higher price from those seeking breeding stock, as compared with persons selling other members of the species.

21 Efforts are ongoing to unify substantive patent law globally, at present. *See* Tvedt, 2007.

22 CBD, Arts 1, 2, 9(b), 15 and 16.

23 Among the dozens of inquiries into this question are the books in this Series, including especially Cabrera and Lopez 2007 at 1.2, and Tvedt and Young, 2007, at 2.7, 4.1 *et passim.*

24 This issue is detailed in Young, 2002, as well as in Tvedt and Young, 2007, at 4.1.

the parties may sometimes create a 'contractual definition,' clarifying what the term means when used in this contract. Another practical/contractual solution will be to use a completely different term. Often, however, these approaches are not available when dealing with ABS terms. There is a possibility that, for purposes of source-country law, if a contract that does not use the (legally ambiguous) CBD terms and definitions, it may be found to violate national ABS law or it may be found that after a first contract is completed using a different term, a second negotiation will be necessary to address the transfer of 'genetic resources.'

1.2.2.2 'Providers' and 'countries of origin'

Clause 15.3 of the Convention states that ABS applies only where the 'country providing genetic resources' meets *one* of the following criteria:

- It is a '**country of origin**' of that resource – that is, the resource was found in situ, within that country, rather than having been introduced or obtained from a collection in that country; or

- It has 'acquired the genetic resources [from a country of origin] in accordance with this Convention' i.e., the country has obtained an ABS contract or other formal right to the 'genetic resource' or its utilisation.

This limitation on who may be 'providers' raises some as-yet-unanswered questions –

- How does one determine which country is a 'country of origin'?

- As of what date is 'origin' determined?[25]

- Is it necessary to trace the precise origin of every specimen back to a specific 'country of origin'?

- What happens if the user obtained biological samples from a local collection or propagator, but that propagator had not formally obtained the rights to use the genetic resources 'in accordance with the CBD'? and

- What happens when two different users obtain identical genetic resources from two different countries?

When one remembers the increasing prominence of patents and other IPR laws in the ABS context, these questions take on a new meaning. It is easier to understand some of the national concerns about ABS rights, when they are viewed in this context. Countries fear that they will lose rights over their genetic resources by granting access to a user whose home country allows it to patent naturally occurring genes. As discussed in the next section, commentators have noted that, if allowed, such a patent could devalue the source country's interests in its genetic resources.

1.2.3 The paradox of 'ownership' of genetic resources

In expecting ABS to operate through contracts, the CBD negotiators and advisors assumed that 'genetic resources' could be owned, or at least that the right to utilize them could be legally controlled by the 'country providing the resources' (in this book, called the 'source country') or the person(s), agenc(ies), or communit(ies) designated by that country. Among other ambiguities, however, there is still no legally rational system for explaining what it means to 'own' (or have the right to control) genetic resources. This is because of a basic paradox in the ABS concept, as expressed in the following four-step analysis:

- Step 1: Genetic resources have a broad range of potential sources:

  - The gene sequences and biochemical formulas of an entire species (subspecies or variety) are potentially duplicated in all members of that species.[26]

25 In some cases, the introduction of species by human means has been documented as occurring more than 13,000 years ago. In others, it has occurred through non-intentional transfers, such as the introduction of invasive species through international watercourses, sometimes within recent memory, sometimes longer ago. (Young, 2005b).

26 The legal issues surrounding animal genetic resources and human genetic material may be an exception to this, given that they are more often focused on the qualities of a specific individual that make him/it different – i.e., why one human is resistant to a persistent virus, for example, or the genetic qualities that determine that one racehorse will be a consistent champion and another a future plowhorse.

- The only *physical* control on the ability to research these characteristics is whether the researcher (or some previous researcher) is able to gain access to sufficient samples on which to conduct research.

- Step 2: 'Ownership' and/or the legal right to control or dispose of genetic resources, may be disseminated among many separate, unrelated holders:

  - Article 15 says, at minimum, that every country in which a particular species is found *in situ* has sovereign rights in the genetic resources of that species. However, nearly all species have a natural distribution that extends to more than one country.

  - In some countries, national law or practice has disseminated genetic-resource 'ownership' rights more widely, stating that every person who owns any specimen of the species owns that specimen's genetic resources. In some cases, one can own a specimen simply by owning the land on which it is found. This point multiplies by hundreds or thousands the number of persons or entities that have a right to control the genetic resources of each species or variety.

  - Despite this diffusion of 'ownership', however, it is generally assumed that any person or country that is an 'owner' of genetic resources may grant access to those resources, without consulting other owners/holders of specimens of that species, and without recognising their separate rights in the same genetic resources.

- Step 3: The user of genetic resources may need only a relatively small amount of sample material of a species in order to be able to utilize its genetic resources permanently.

  - Modern industrial and commercial development processes can often find ways to duplicate or synthesize a species' genetic and biochemical elements based upon only a few samples or in some cases, no samples at all (if they receive detailed research data).

  - Once the initial research and development is complete, the user will often need no further physical specimens from any source.

  - This will be true regardless of whether the user first obtained an ABS contract or permit.

- Step 4: Following access, many users seek to convert the non-exclusive genetic resource (legally held and potentially usable by a great many providers) into an exclusive resource, which no other person, country, or entity may use.

  - The user, if located in a country that allows this, will sometimes attempt to patent specific genes from that species or variety.[27]

  - The patent or other exclusive right could prevent commercial or pre-commercial use of the genetic resource (gene) by the country of origin,[28] other countries-of-origin, by other holders in those countries or by users who seek access to that genetic resource, unless those holders and users pay a royalty to the patent holder.

  - Arguably, this kind of IPR defeats the purpose of ABS (which was intended to provide an incentive for conservation and sustainability), since the financial or potential value of species will be devalued following the issuance of the patent, thereby diminishing the conservation incentive.[29]

  - It seems clear that this type of IPR would also defeat the purpose of patents, which has been described as encouraging and protecting innovation. By contrast, an IPR which restricts the ability of other innovators to use the naturally occurring genetic resources to build new products would appear to be an impediment to inno-

27 Although the technology needed to isolate natural genes is generally available (i.e., there was no innovation in the isolation process), and no other 'inventive step' is involved, these patents have been upheld in at least two countries (Australia and the US).

28 One commonly used example is the US patent of the enola bean [sometimes called the 'yellow bean case' or 'Mexican bean case'], discussed in Young 2006, but later rescinded.

29 In theory, it also defeats the purpose of IPR protections, which are intended to enable innovation, rather than to prevent access to raw materials and natural examples, as noted below.

vation, as well as a serious financial harm to the countries of origin.[30]

This paradox boils down to a simple question: *If the user may obtain the right to genetic resources from any holder, how can he rationally convert it into an exclusive right (patent of the natural gene or traditional variety), without permission from all other holders?* In essence, why should the right of one person or community or country 'win' over the identical right of others and obtain a benefit-share?

1.2.4 Prior informed consent and mutually agreed terms

Two concepts – prior informed consent (PIC) and mutually agreed terms (MAT) – were clearly considered essential by the drafters of Article 15, appearing in three separate places. Clause 15.4, requires that access may be granted only on the basis of mutually agreed terms; Clause 15.5 adds that the country must also give its 'prior informed consent' to that access; and Clause 15.7 notes that benefit-sharing, too, must be conducted on the basis of mutually agreed terms.

To the commercial user or contract lawyer, these provisions appear to be simple restatements of two of the most basic contractual principles:

- that all contracts are valid only when the parties both consent, based on the receipt of all relevant and proper information (i.e. that neither party is concealing something that he would be obliged to disclose[31]) before consent is given; and

- that the terms of a contract are only binding where they are 'mutually agreed,' so that if one of the parties does not consent or agree, there is no contract, no matter what reason lies beneath that failure to consent.

In the CBD's environmental context, however, PIC and MAT are not viewed in this 'normal' (contractual) light, but are given special meanings. For example, a number of countries have chosen to merge their PIC and MAT with public participation principles. In some cases, the participating public is directly part of the consent or agreement of PIC and MAT. This might mean that the user must get separate consent from each community, and may even be required to hold a public meeting – even whether the country has already given its contractual consent.

In some cases, the law provides that MAT too must be directly approved by the community or other provider. This can create difficulty for the user, researcher or other access seeker who wants to collect material in a large collection area. He may have to agree to completely different contractual requirements in each community.[32] If the communities are adjacent, the researcher may be expected to know precisely where each sample was collected, and to know exactly where the boundaries between various communities are located.

Clearly, the policy reasons underlying PIC and MAT in the ABS context may be very different from the purposes driving the parties in normal commercial negotiations. As a consequence of this difference between ABS contracts and other contracts, the parties to ABS contracts often find themselves in conflict with one another. This conflict is often born of misunderstanding. To resolve these misunderstandings, the user must recognize that ABS-requirements of PIC and MAT are not simply a restatement of contract law. As noted above, the task of obtaining PIC and agreeing to MAT are very similar to environmental permit requirements, rather than commercial negotiations. In many respects, they can be likened to 'environmental impact assessments' (EIA) or a land-use variance decisions. Viewing the process in this way gives the would-be user a basis for planning how he will approach the process, and for evaluating the commercial risk that it adds to his proposed activities. Like EIA and land-use approvals, PIC and MAT processes for ABS can be very unwieldy and can be delayed or stymied by public opponents.[33]

30 Consider the possibility that one user could patent coltan, charging a royalty to all industries using it in telephone or developing new uses for it in computer and other technologies. The result would be an impediment to future technological innovation, and would also negatively impact the markets and prices for copper and coltan, affecting the value of those resources.

31 Discussed in 2.3.1.3.

32 Benavidez, 2004.

33 It is sometimes claimed that opposition at the local level (in PIC and MAT processes and claims of biopiracy) arises out of the fact that benefits are not shared with indigenous groups and communities, but are distributed in other ways (to protected area agencies, etc.) While some local activists

Conversely, the provider must recognize the commercial role that 'informed consent' and 'mutual agreement' have in contracts, and be clear about what PIC and MAT mean.

1.2.5 Granting and obtaining reasonable access to genetic resources

The CBD's discussion of access to genetic resources is the source of one of the Convention's greatest ironies. Clause 15.2 requires countries to 'facilitate access to genetic resources,' but clearly does *not* require legislation. Its only reference to legislative measures is to impose a limit on legislation – that countries should 'not impose restrictions that run counter to the objectives of this Convention.' The other two clauses relating to access – clauses 15.4 and 15.5 – also do not directly call for any kind of direct governmental measures.

Paradoxically, however, nearly all of the ABS legislation that has been adopted by any country or regional body to date relates to *access*.[34] Following the adoption of the CBD, many countries' adopted new access controls where none existed before, and few (if any) loosened pre-existing restrictions. As a consequence, many researchers claim that the impact of ABS was to make access more difficult and regulatorily complex – the opposite of the expected and desired outcome.

1.2.5.1 Applying ABS in source countries with no ABS legislation

Under Clause 15.5, the PIC requirement applies in all countries, except those that have specifically 'determined otherwise.' The CBD provisions regarding MAT are not dependent on law at all. One cannot simply assume that a country has renounced any control over its genetic resources simply because that country has not adopted a piece of legislation with the name 'ABS Law' or something similar. PIC and MAT requirements always apply in all countries, except if the country has made an affirmative statement that it will not assert rights over its genetic resources. At present only about 10% of CBD Parties have adopted specific 'ABS law' governing 'access' issues. To date, no country has adopted any law, policy, decree or other instrument which specifically states that it categorically allows any users to gain access to or utilize the country's genetic resources without PIC and MAT.[35]

In the absence of such legislation, all users must obtain PIC and MAT with regard to all access to or utilization of genetic resources of foreign origin. PIC and MAT can be very difficult to apply, however, especially if a country has not adopted specific ABS legislation. In that case, the user's compliance must be determined on the basis complex research into the source country's laws. For example, virtually all countries have very complex rules governing:

- ownership of various types of property,
- the rights and duties of government as sovereign over all resources in the country,
- the rights and duties of government as trustee of resources that are (i) part of the national patrimony; (ii) common property of all citizens; and/or (iii) unowned until someone takes specific steps to obtain exclusive rights to them.

These laws apply to all property within the country, including genetic resources, even if there is no ABS law. A relatively detailed legal analysis of relevant law (or assurances from a qualified and authorized official) will be needed in order for the would-be user to know what law applies. A number of countries have begun efforts to help their users in this difficult task, obtaining information from key source countries regarding how PIC and MAT requirements can be satisfied. At present, however, these informal efforts include some risk, since few countries are willing or able to make a firm statement about how their courts, agencies or central governments will interpret ABS requirements in future.

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take this position, others oppose ABS on environmental or other social grounds. This ties into the earlier point that the providers often view ABS as a social-welfare or environmental conservation program, rather than as a basis for commercial negotiations.

34 National ABS legislation is provided through the CBD's Database of ABS Measures at http://www.cbd.int/abs/measures.shtml. The lack of national legislation governing the matters where legislation is required under Article 15 is discussed in Tvedt and Young 2007, at chapter 3, *et passim.*

35 Norway has suggested that it might take this approach. *See* Tvedt and Young, 2007 at Chap 3.

1.2.5.2 Practical legal administrative requirements for access

Although not required to do so, a number of countries have attempted to develop 'access' legislation.[36] Indeed, most users and countries have recognized that there are certain aspects of access that can and should be clarified by the adoption of legal or administrative provisions.[37] To date, national legislative draftsmen have found it difficult to adopt functional law, because of the legally confused nature of Article 15 and the relevant definitions. At present, about 18 countries have formal ABS access laws, and few if any would claim that they are functioning well. Thus, the experience of more than a decade of trying to comply with the few examples of access legislation or apply it legally suggests that there is a need to rethink what access means, if access laws and procedures are to be useful.

If a national legislative regime answers the following questions in a legally clear and sufficient way, ABS contract negotiation could be easier for both user/applicants and provider-countries[38]:

- Who (which agency or official) is authorized to make decisions regarding access to genetic resources including giving PIC and agreeing to MAT?
- Who can issue PIC and MAT and who what types of applicants may obtain them?
- What information must be provided in order to comply with PIC and MAT requirements?
- What criteria are applied in granting or denying applications?[39]
- Does the country have mechanisms for designation of trade secrets or other confidential information, and for maintaining confidentiality of information that is so designated?
- In legal terms, what rights are granted by PIC and MAT decisions?
- Are there procedures for appeal from the decision, and if so, at what point is the decision 'final' (giving legal certainty to the successful applicant)?[40] and
- What powers, rights and duties exist regarding monitoring, oversight, revision, revocation, and other post decision actions by government?

Beyond these basic procedural requirements, however, the looming difficulty for the adoption of access legislation and procedures relates to 'post-access' concerns (discussed in more detail below.) As noted by other authors, ABS cannot be functional unless it operates both in the source country and in the country or countries with jurisdiction over the user.[41] Many of the countries which have imposed strict and detailed access requirements are, in essence, trying to find a way of ensuring that the user will continue to comply with ABS, even after the genetic resources (in physical or information form) are no longer in the source country. Upon analysis of existing national ABS laws and international discussions, it appears to be a strong possibility that source countries would be happy to streamline their access provisions, if there was an international system on which they could confidently rely to support their rights after the resources and user are outside of the source country.[42]

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36 In Glowka, 1998, the number of countries said to be in process of adopting ABS legislation was researched and fifty countries were listed as either having such laws currently engaged in the process of adopting them. Over the ensuing years, this figure has been cited by many other authors. A number of countries not listed in the original count have indicated that they are seeking to adopt ABS laws, while many of those on the original list have given up the effort, pending some better legal understanding of the process.

37 In the Bonn Guidelines, for example, discussion of the creation of legal systems for the provision of access to genetic resources is more than seven times as long as the discussion of matters relating to the user-side law and ensuring the payment of benefit-sharing.

38 In some developed countries, ABS NFPs are increasingly focusing on efforts to compile information on access-related laws in developing countries, as assistance to users. Personal communication with Seizo Sumida (Japan), Sezannah M Seymour (United States), Geoff Burton (Australia) in 2007.

39 Given that this is a decision to 'sell' its resources, the country will have broad leeway to make choices, including to make separate rules for foreign users. *See* 2.5.2, below. It is only fair, however, that such criteria should be known to all.

40 For a more extensive discussion of the issue of legal certainty, see Young, 2005.

41 *See* Young, 2006; Tvedt and Young, 2007.

42 *See* Young, 2006.

At this writing, the issues of post-access legislation and the need for a linkage between provider-side and user-side measures have been taken up into the international debate on ABS in several ways. Some negotiators propose 'standard legislation'[43] based on two apparent needs – on one hand, the need of users for a simple uniform system which will streamline their efforts to obtain access, and on the other, the need of user-side courts to have a consistent basis for interpreting other countries' national ABS provisions. The concept of standard legislation is normally not effective in international law, given that few countries will agree to be bound by law that was not created through their own legislative processes.

Clearly, there are possibilities for resolving this conflict, including through further clarification of what would be meant by 'minimum standards for ABS legislation.'[44] Possibly the best approach would be to identify a range of possible provisions and options, and then adopt an 'agreed interpretation' of each option explaining how it would be applied in law. This approach would give flexibility to each country, while providing the needed clarity for the overall regime. Although far from simple, this solution appears to be legally and practically possible,[45] if the rest of the ABS regime is agreed.

1.2.6 User-side measures: The unfulfilled requirement

Clause 15.7 specifies the duties of each country with regard to users under its jurisdiction. This is the only provision in Article 15 that specifically requires governments to adopt legislative or other measures. It requires each country to take legislative, administrative or policy measures (whichever are appropriate), 'with the aim of sharing' (i.e., which lead to the result of sharing) two things –

- results of genetic-resource research and development and
- benefits arising from the commercial and other utilization of genetic resources.

The law does not require new legislation if the country already has laws which meet this obligation. To date, however, no country appears to have adopted such legislation, and no country already had legislation in place that meets this requirement.[46]

In addition to the fact that they are required,[47] 'user-side measures' are absolutely essential to functional ABS. No country can regulate persons or activities that are outside of that country's own jurisdiction. Consequently, unless the overall ABS regime mandates or effectively motivates benefit-sharing, the ABS measures of the source country become effectively voluntary measures, even if they are stated as binding measures.

This is the other half of the irony mentioned in 1.2.5, above. While there is considerable ongoing discussion of the need for 'access' legislation (which is not formally required in the CBD), no country has adopted any of user-measures (which are expressly required.) The reasons behind this failure in developed countries seem to be legal, political and technical.[48] Developing countries may have an added reason – their (unfounded) belief that this clause applies only to developed countries.

43 Such proposals were forwarded by both Australia and the EU in early meetings of the AHWG-ABS.

44 Proposed by the EU as part of their presentation in AHWG-ABS-6, January 2008.

45 The key to this approach will be ensuring that it includes all possible options, and that it considers the interlinkage among the various provisions and options.

46 *See* Tvedt and Young, 2007 at chap. 3.

47 One frequent oral commenter from the US interprets 'as appropriate' to mean that Article 15.7 is not required – that the phrase 'as appropriate' indicates that countries are not required to have or adopt user measures. A legal analysis of the many uses of that phrase throughout the CBD, as well as the rules set forth in the Vienna conventions for interpreting international agreements suggests that it indicates a choice by the legislating country, among the three options, and/or underscores the fact that the particular measures adopted by a country will be unique to its own needs and system. It does not constitute a loophole in the Parties' obligation to implement each provision in good faith.

48 The complexities that have prevented the adoption of 'user measures' up to now are discussed in another book in this Series: Tvedt and Young, 2007.

Although the current state of compliance with Article 15.7 is not very promising, there are a few examples of positive efforts. One of the most important is the 'Japan Guidelines on ABS.' Although a completely voluntary instrument, the guidelines are formally supported and used by the Ministry of Economy Trade and Investment ('METI'), which pays particular attention to the relationships between Japanese companies and other countries. Where any ABS claim or allegation is leveled against a Japanese company, the Guidelines serve as a basis for discussions between METI and that company. As a result of cultural and other factors in Japan, a company that is singled out for such discussion is intensively motivated to come into compliance with the Guidelines, and other companies have a similar interest in avoiding being singled out at all. Consequently, the use of voluntary guidelines has a high level of effectiveness in Japan. Currently, however, the practical value of those guidelines in reducing disputes and claims of biopiracy has been limited by the lack of clear international standards regarding ABS and genetic resource issues.[49]

Similarly, in Chapter 6, this book describes provisions used by the US's National Institutes of Health, providing an incentive to those who seek to provide technical assistance under NIH grants. Such applicants must prove their compliance with certain ABS-like requirements that have been adopted by that agency, in order to receive assistance. Although focusing on technical assistance providers (who are presumably more likely to recognize the underlying equitable purpose of ABS), this program is linked to business/commercial activities, given that the NIH and other US Governmental programs are specifically intended to acquire rights to genetic and biochemical compounds which can later be transferred to commercial entities.

1.2.7 Other components of the benefit-sharing objective

Finally, although Article 15 essentially creates the core framework of ABS, there are many other provisions which are clearly considered to be part of the ABS concept, which were not significantly addressed in the Bonn Guidelines or the discussions of the AHWG-ABS. Potentially critical and useful to a balanced and functional ABS process, these components are as follows:

- Clause 15.6 calls on countries to 'endeavor' to develop and carry out scientific research based on genetic resources '*with the full participation of, and where possible in the country providing the genetic resources* [source country].'

- Clause 16.3 requires countries to adopt legislative, administrative or policy measures to provide the source country with access to and transfer of technology which makes use of genetic resources provided by that country on mutually agreed terms, and with appropriate protection to the innovator's intellectual property rights in the new technology.[50]

- Clause 19.1 requires countries to adopt legislation *'to provide for the effective participation in biotechnological research activities'* by source countries, especially those that are developing countries, and states that 'where feasible' these activities should take place in the source country.'[51]

- Clause 19.2 calls for parties to take '*all practicable measures to promote and advance priority access to the results and benefits arising from biotechnologies,'* [52] and

- Article 17 requires countries to *'facilitate the exchange of information, from all publicly available sources…,*

49 Personal communications, Seizo Sumida, November 2007.

50 CBD Article 16.3: '*Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that Contracting Parties, in particular those that are developing countries, which provide genetic resources are provided access to and transfer of technology which makes use of those resources, on mutually agreed terms, including technology protected by patents and other intellectual property rights, where necessary, through the provisions of Articles 20 and 21 and in accordance with international law and consistent with paragraphs 4 and 5 below.*'

51 CBD Article 19.1: '*Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, to provide for the effective participation in biotechnological research activities by those Contracting Parties, especially developing countries, which provide the genetic resources for such research, and where feasible in such Contracting Parties.*'

52 CBD Article 19.2, which provides in full that '*Each Contracting Party shall take all practicable measures to promote and advance priority access on a fair and equitable basis by Contracting Parties, especially developing countries, to the results and benefits arising from biotechnologies based upon genetic resources provided by those Contracting Parties. Such access shall be on mutually agreed terms.*'

taking into account the special needs of developing countries' and notes specifically that *'Such exchange of information shall where feasible, include repatriation of information.'*

These provisions mostly call upon governments to take action. No country has adopted any measures that would tie these laws to ABS objectives and commitments. For commercial and non-commercial users, however, they may have other impacts.

A country might make significant progress in achieving its user-side ABS obligations by attuning its technical assistance and technology transfer programs to reflect ABS objectives. Such provisions could be designed to have two impacts: (i) to provide recognition and incentive to users and other private actors taking these measures as part of their benefit-sharing programs; and (ii) to specially recognize special rights or priorities for 'the country providing the genetic resources.' As an example of the latter, national technology-transfer laws might give priority or other incentives to users of foreign genetic resources that comply with the source country's ABS requirements.

1.3 The Bonn Guidelines

The Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization[53] are the final outcome of a multi-year process directed at improving the performance of the ABS concept. They represented an effort to make ABS functional, through soft law and COP mechanisms, to avoid the need to negotiate some other solution to the ABS problem.

Although they did not succeed in eliminating the need for further international negotiations, the Bonn Guidelines may indicate a broad level of agreement across all CBD Parties regarding some aspects of ABS. Unfortunately, however, the level of consensus is not clear. Owing to many unresolved controversies, the Guidelines ultimately are 'voluntary' and 'evolving' – indicating that their contents are neither 'recommendations' nor 'best practices,' but rather a list of possible actions.[54]

The following summary describes only particular Guidelines most relevant to ABS contracts. Following these points, we discuss the Bonn Guidelines' provisions regarding the possibility of ABS incentives, and some perspectives on why the Bonn Guidelines did not succeed in forestalling the need for more ABS negotiations.

1.3.1 Primary elements of the Bonn Guidelines relevant to ABS contracts

The Bonn Guidelines focus on five overall issues, which could affect how users interact with providers: (i) international and national institutional matters, (ii) contractual elements and roles, (iii) public participation, procedural matters, (iv) benefit-sharing and distribution and (v) implementation.

1.3.1.1 Institutional arrangements

Institutionally, the Guidelines strongly recommend a number of institutional elements, which were not previously required by the CBD's text. In particular, they specifically call on the Parties to designate a specific national focal point (NFP) on ABS issues to better enable contact with those seeking access, and to specially designate 'competent national authorities.' These provisions focus on 'provider side' ABS responsibilities (access). In fact, however, national competent authorities must also 'monitor and evaluate access and benefit-sharing agreements [of other countries; as well as the] implementation/enforcement of ABS agreements' by their users.[55] Agencies with

53 CBD COP Decision UNEP/CBD/COP/6/24 Annex (2002).

54 This was not the original intent, and the initial draft was phrased in much stricter terms (speaking of 'requirements' and what the users and providers 'shall do.') Given that they would have been adopted by COP decision, rather than plenipotentiary process, this would not have been particularly 'binding' in any legal sense, even if adopted with that language. The negotiations were lengthened by multiple requests to eliminate any 'mandatory' language (changing 'shall' or 'must' to 'should' or 'could,' or 'may consider', or eliminating any reference to 'requirement.') Eventually, to cut this short, it was decided to simply state in general that the Guidelines are entirely voluntary, reflecting options and ideas, rather than recommendations. As a consequence, the phrasing within the document is quite inconsistent -- stronger language was retained as to any provision that had not yet been discussed, but eliminated in others. Since all provisions are 'voluntary,' this difference is generally meaningless, but remains confusing.

55 Bonn Guidelines, Art. 14 c and d.

commercial responsibilities must be a main participant in the NFP processes. To date, however, most NFPs are chosen for their biological responsibilities and expertise.

One possibility with regard to the NFPs is that they can form a functional link between the source country and the user country or countries. NFPs may play an important role in supporting both users and providers, with information on national ABS laws and procedures in other countries. As noted above, few CBD Parties report that they are undertaking this work. At least one user country (Japan) is going beyond this passive role, developing formal and informal agreements with source countries, to help ease the procedural and diplomatic burdens experienced by its users in seeking ABS permission.[56]

1.3.1.2 ABS elements and processes

The basic message of the Guidelines' regarding the duty of participants involved in ABS can be summarized in five words:

'comply with the ABS contract.[57]

In elaborating on this basic message, the Guidelines offer other comments on the roles of stakeholders and the processes and procedures.

The Guidelines mix legislative guidance with advice about matters that would (or could) typically be addressed in individual ABS contracts. This may lead to some confusion, since some matters must be fixed by legislation, where others may be more flexible 'negotiating points' that the parties to an ABS contract would normally decide by agreement. Some matters may be either one or the other, depending on whether the country wants to control them strictly or to enable the parties to use them as negotiating points in their individual negotiations.

For example, the CBD calls on Contracting Parties 'as much as possible', to use the genetic resources 'in, and with the participation of, the providing country.'[58] This requirement is imposed on user *countries*, not suggesting that they should pass this responsibility to the users directly.

Regarding this requirement, the Guidelines do suggest that each ABS contract should call on each *particular user* to bear this responsibility. As a practical matter, however, some countries will prefer to leave this matter flexible for negotiation, allowing the location of the user's operation to be a commercial benefit or trade off, in exchange for other concessions.

By contrast some elements of the ABS process that are considered 'possible components' under the Guidelines (prior informed consent, agreement on mutually agreed terms, assignment of tasks) are normally thought to be required by the CBD text. The Guideline list examples of the many other issues that could be included in law or regulations defining these processes,[59] but might also be considered negotiatable or variable (preferred in some cases or inadvisable in others).

1.3.1.3 Participation

'Participation' (in the sense of the 'public participation' processes recommended in the Guidelines as an element of good governance) is not required under CBD Article 15. (In fact, the CBD's only reference to direct public participation is found in its provisions for environmental impact assessment.[60]) Nevertheless, several countries, and a great many commentators and technical assistance providers have stated that the CBD's requirement of 'prior informed consent of the country providing the resource' specifically includes public participation by some group of individuals within that country.[61] The selection

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56 Bonn Guidelines, Art. 59.

57 This is expressed in many different ways. In Guideline 16.c, for example, the responsibilities of users include the requirement that users should not to commit fraud (clause 16.c.i: 'only supply genetic resources… when they are entitled to do so') while providers must 'strive to avoid imposition of arbitrary restrictions on access to genetic resources.' (clause 16.c.ii)

58 Bonn Guidelines, 16.b.vii.

59 Bonn Guidelines at §§ 22-44.

60 CBD, Article 15 includes the phrase 'full participation of the country providing resources'. In addition, Article 15.6, which calls on countries to ensure that users of genetic resources should carry out research and development activities in the provider country and with that country's involvement, where possible.

61 *See,* e.g., Tobin and Swiderska, 2001

of which groups may participate, and what form that participation takes is tied to a number of current uncertainties, including especially the 'property rights' and 'ownership' issues mentioned above. This has contributed a measure of confusion and difficulty for ABS applicants attempting to obtain PIC and negotiate ABS Contracts.

In practice, ownership and right-holding with regard to genetic resources differ from country to country. As a result, the extent and nature of public participation in ABS transactions may also be dramatically different. Where genetic resources are entirely considered 'property of the country' or 'national patrimony' or similar status, public participation would apparently require a very general level of participation – all citizens and residents have an interest in ensuring that these resources are used properly.[62] If each particular landowner has ownership/disposition rights and responsibilities over the genetic resources found on his lands, then some countries assume that public participation will be relevant only to the person, entity or community which owns the land. to individual (whether private individuals or the government as to lands it holds specifically) or specific types of communities.[63]

The Bonn Guidelines have taken a variety of inconsistent positions regarding participation issues.[64] They do not provide any guidance for users, at most suggesting possible approaches for national legislation. The most that can be concluded from the Guidelines regarding this issue is that genetic resources in each country will probably fall somewhere on the spectrum between 'entirely with the national government' on one hand, and 'entirely vested in private owners and communities' on the other. (Normally, the public does not have significant rights to participate in the private negotiations between the private owners of property and private purchasers seeking to acquire it.)

Participatory processes are very demanding and difficult obstacles for ABS applicants. Some of these obstacles have their source in broader ambiguities in the ABS concept. With no clear international answers for these complexities and demands, users can find little guidance or assistance. The only solution appears to be research – to determine each country's law and recent experience.

1.3.1.4 Benefits and benefit-distribution

Many Guidelines discuss 'benefits,' however, these discussions generally focus on the forms of payment that can be used to meet users' benefit sharing obligations under the ABS contract. They do not clarify the meaning of the term 'benefits arising from the utilization of genetic resources' – i.e., the benefits which are to be 'shared.' The Guidelines do not provide any Guidance about how to value the 'benefits arising' or how (and in what percentages) they should be shared.[65]

Instead of the direct benefit-sharing obligation, the Guidelines provide guidance regarding the distribution of benefits within the country. This issue, however, is entirely a matter of national sovereignty. This approach is clearly reflected in the CBD, which suggests that distribution of benefits is determined by the source countries themselves. As noted above, Article 15 includes a separate MAT requirement relating to benefit-sharing. In essence, this provision ensures that the distribution of benefits to particular individuals or communities is not decided by the user and those individuals/communities alone, but *must* be approved by the provider country as well.

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62 The Philippines and Costa Rica are generally in this category. *See* Carrizosa, *et al*. 2004.

63 The US appears to take this approach, given that the only specific legal discussions of genetic resources in US administrative documents imply that no public participation has been required where the genetic resources are collected from government lands. A proposal has been aired which would require public participation where the resources are taken from national parks, however, based on the fact that these resources are 'public property' in which the citizens have an interest. Discussed in Tvedt and Young at chapter 3.

64 Some provisions of the Bonn Guidelines appear to recognize the variability of ownership interests, such as § 17, which notes (in discussing the PIC process) that 'due to the diversity of stakeholders and their diverging interests, their appropriate involvement can only be determined on a case-by-case basis. Similarly, § 26.d, states that '[t]he consent of relevant stakeholders, such as indigenous and local communities, as appropriate to the circumstances and subject to domestic law, should also be obtained.' This suggests the assumption that each ownership situation will be different. Other provisions to this effect call for public consultation 'in each step of the process, including … [w]hen determining access, negotiating and implementing mutually agreed terms, and in the sharing of benefits.' (section 17 and 18.) These assumptions are contradicted to some extent by § 19, which calls for 'appropriate consultative arrangements' that could involve the creation of standing 'national consultative committees, comprising relevant stakeholder representatives,' and expect that each country can create one such committee to address all public participation. This suggests that many participation choices are expected to be generic, rather than case by case.

65 A detailed discussion of the difference between the form of payment of a benefit-share and the identification of the benefits that must be shared is found in Tvedt and Young, 2007, at 4.1.3.

As a consequence, the Guidelines provision on this point cannot be applied by a user unless the particular source country has specifically agreed to adopt this Guideline. It is not clear whether this guidance is offered to the source country only, or also to the user. Those provisions recommend that

> *benefits should be shared fairly and equitably with all those who have been identified as having contributed to the resource management, scientific and/or commercial process, [including] governmental, non-governmental or academic institutions and indigenous and local communities. Benefits should be directed in such a way as to promote conservation and sustainable use of biological diversity.*[66]

The most important aspect of the Guidelines' provisions regarding the distribution of benefits, however, is the fact that they are limited in scope. They focus on financial benefits (money payments and the transfer of material items of value) and do not consider the more difficult questions involved in the sharing of data and technology. In particular, the Guidelines leave open questions regarding the confidentiality of data, samples and other information which is identified in the Guidelines as a 'benefit' for purposes of ABS.[67]

1.3.1.5 Procedural Matters: Issuance, Implementation and Enforcement of ABS contracts

The guidelines provide a limited advice on the negotiation, issuance, execution and enforcement of ABS contracts. Although relatively sketchy, these provisions may provide a base for legislation on a few issues. For example, they require

- that the decision to either grant or withhold PIC should be in writing,
- that it may be in the form of a permit or license, and
- that the procedure for granting it should be transparent.[68]

The Guidelines on MAT indicate strong recognition of the importance of legal certainty for source countries, and strong support for reduced transaction costs, expedited or streamlined procedures and other steps to avoid placing an undue burden on users. They are not clear on how to balance these matters against the provider-country government's fiduciary obligations to its citizens.

Regarding enforcement, the statements in the Guidelines provide few comments, which are not clear about which actor or role is being discussed. For example, in Guidelines 59 and 60, enforcement is discounted with only the (generally unsupportable) implication that (i) only contractual law will be needed to implement ABS; and (ii) source countries can penalize users who violate ABS requirements, by actions under their own (source country) law.[69] Both of these assumptions are legally incorrect, since the ABS system is too ambiguous to enable the use of contract remedies,[70] and such remedies cannot be applied where no contract has been obtained. In that case, there is presently no way for the source country's laws to be binding on users and resources that are outside of the source country's jurisdiction.[71]

1.3.2 Incentives and other matters of interest in ABS contract negotiations

The poor performance of ABS prior to the Bonn Guidelines, although generally recognized, was not ascribed to any particular structural or political source. Consequently, the Guidelines do not deeply consider the possibility of other approaches as alternatives or enhancements to the mandatory, contract-based conceptual model. In Guideline 51, however, they do indicate some possibility that incentive mechanisms might improve ABS per-

66 Bonn Guidelines, Art. 48.

67 An initial discussion of the unaddressed challenges presented by the sharing of data and research results is found in Tvedt and Young, 2007, at 6.4.

68 Bonn Guidelines §§ 38-40.

69 *See* Tvedt and Young at 6.4.3.

70 Young, 2007.

71 Hence, if ABS is to operate as a mandatory (rather than incentive) system, it cannot rely on contracts as its only legal basis. Tvedt and Young, *supra*.

formance. These were not offered as 'best practices,' but only ideas and suggestions, which 'could be used in the implementation of the guidelines':

(a) The identification and mitigation or removal of perverse incentives, that may act as obstacles for conservation and sustainable use of biological diversity through ABS, should be considered;

(b) The use of well-designed economic and regulatory instruments, directly or indirectly related to ABS, should be considered to foster equitable and efficient allocation of benefits;

(c) The use of valuation methods should be considered as a tool to inform users and providers involved in access and benefit-sharing; [and]

(d) The creation and use of markets should be considered as a way of efficiently achieving conservation and sustainable use of biological diversity.

Some further discussion of incentive and regulatory design concepts, based on analysis of the manner in which successful incentive mechanisms operate in other contexts, is found in other books in this Series.[72]

1.3.3 Why were further international ABS negotiations needed?

Although intended to help avoid further negotiations, the Bonn Guidelines did not manage to do so. Although including many uncontroversial and well understood aspects of ABS administration, such as PIC, MAT and methods and forms of payment, they did not fulfill the Parties' intensive need for implementable solutions nor provide mechanisms for addressing integral obstacles to the realization of the third objectives and of Article 15.

As discussed in greater detail elsewhere, many of those obstacles cannot realistically be addressed unilaterally by source countries' national law or by contract/permit processes alone. Many of these obstacles are obvious, such as the vagueness of terms like 'genetic resources' and 'utilization of genetic resources,' which prevent the ABS concept from achieving the definiteness required in order to be legally functional.

The greatest obstacle to ABS functionality and legal certainty is the internationality of the ABS process. This is one issue that absolutely cannot be addressed by national law, or by voluntary guidelines. In a very real sense, this is why the current negotiations were and are necessary. By definition, every ABS contract or permit is international, since Article 15 applies only to situations in which the user is from a different country than the source country. The 'internationality problem' in ABS has two faces. First, it can only function if every country adopts both provider-side and user-side legislation. This is essential, because each country's national laws apply only to persons, activities and property within that country or directly under its jurisdiction. If the country with jurisdiction over the user does not require its users to comply with the source country's ABS requirements and/or to engage in benefit-sharing, then the user will not be under any legal obligation after he leaves the source country. Until this issue is addressed, the ABS concept will be legally unstable no matter how uniform national PIC and MAT processes might become.

Second, even with user-side and provider-side legislation in every country, it is necessary that certain aspects of that legislation should be written and implemented in a way that promotes trans-border application. For example, the coverage of ABS – i.e., the list of resources and activities that are covered under ABS law – needs to be somewhat uniform. Consider what will happen if the source country has a very broad definition of 'genetic resources' and/or 'utilization of genetic resources' and the user country defines them very narrowly. This will mean that the users' obligation will be different in the source country and in the user country. As a consequence, he may again be free of ABS compliance requirements the instant he is operating in a country in which his activities are not covered by ABS.

72 Cabrera and López, 2007 at 4.3; Tvedt and Young, 2007, at 3.5 and 6.3.

As a result, even after the Bonn Guidelines were completed, international negotiations were needed to resolve critical problems of ABS functionality. In 2002, the delegates to the World Summit on Sustainable Development, and later the Parties to the CBD, agreed that it would be necessary to address these needs in a more formal way.[73] In the ensuing years, another important contribution was added, providing additional basis for these discussions – the International Treaty on Plant Genetic Resources entered into force.

1.4 The International Treaty on Plant Genetic Resources for Food and Agriculture

Adopted in November 2001, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) represents a serious step forward in developing the mechanism(s) through which ABS will become effective. In essence, the Treaty negotiators' task was to address the distinctive existing practices and institutions in the field of agriculture, and specifically to find a way to regularize those activities within the new concept of ABS. The Treaty covers the full range of obligations and commitments regarding 'the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of benefits derived from their use, for sustainable agriculture and food security.'[74] Only one element of the ITPGRFA – the 'Multilateral System of Access and Benefit Sharing' or MLS[75] – directly implements ABS.

Negotiation preliminary to the development of the ITPGRFA began rather quickly after the CBD's adoption. The reasons for this immediate response were very apparent and urgent. For example, the International Agricultural Research Centres (IARCs) – a system mandated to promote transfer of plant germplasm for agricultural variety development – was already in place and operational. The IARCs perform an important and necessary role in enhancing food security and livelihoods around the world. It was thought (or perhaps feared) that the transfer of 'plant germplasm' would be considered to be a transfer of 'genetic resources' under ABS. There were concerns that the original country that contributed each specific 'accession' might insist on receiving ABS benefits from any user who obtained its germplasm through an IARC. One goal of the ITPGRFA negotiations was to ensure that the IARCs' operations, and if possible other transfers of food-related genetic resources, were internationally recognized to be 'in harmony with the CBD.'

In addition, the Treaty has a second and very important impact – it provides primary lessons for future ABS activities and negotiations, regarding the ability to carve out special issues and sectors for specialized treatment harmonized with the CBD. To understand those lessons, it is necessary to consider the four basic ways in which the Treaty's development was quite different from other ABS work:

- it was directed primarily at one particular sector (agricultural plants) and a small number of stakeholders (germplasm collections and variety developers);
- it focused its most urgent attention on the utilization of a specific type of resources (seeds and other germplasm in formal collections);
- it sought to apply ABS to an existing international system which is already in active use by every country on the globe (according to CGIAR, every country has utilized at least one of the IARCs to obtain foreign germplasm for use in variety development and other agricultural research[76]); and
- its system for control of the sharing of plant germplasm was already well established and operating through an internationally standardized contractual

73 The particular decisions and history are summarized in Tvedt and Young at Chapter 1.

74 An overall understanding of the entire scope and provisions of the ITPGRFA can be obtained from Moore and Tymowsky, 2005.

75 ITPGRFA, Part IV, Articles 10-13.

76 Based on the records and data of the Consultative Group on International Agricultural Resources (CGIAR), every country has been involved in the use of germplasm from one or more of the IARCs – a primary resource base providing germplasm from all countries for the development of new plant varieties in other countries. Fowler *et al.,* 2001

document[77] that identified the rights of the user, including prohibiting him from patenting the material obtained and other actions.

Other collections and sources, in addition to the IARCs may be included within the MLS. The system enables them to choose whether and how to include other collections, at some point in the future – i.e., after the country has become a Party to the Treaty.[78]

In addition to its direct impacts on agricultural development, the Treaty provides some useful clarification of particular CBD requirements (access, mutually agreed terms and benefit sharing) as they apply to agricultural variety development. Perhaps most important to the purpose of this book, the Treaty has taken the step of adopting a 'standard material transfer agreement' (SMTA), which must be used, without significant amendment, for all transfers of germplasm under the MLS. Key provisions of that agreement are discussed below, particularly in Chapter 3.

1.4.1 Overall provisions and approach

The most important aspects of the ITPGRFA system, for purposes of ABS contracts, are coverage, enforcement and provisions for farming communities.

1.4.1.1 Coverage

From the ABS perspective, the Treaty operates as a sub-agreement detailing how ABS applies to one group of genetic resources. It provides a legal standard for determining which resources are covered – only those that meet both of two tests – the 'resource test' (genetic resource criteria) (Box 2) and the user/use test (Box 3).

Box 2 The 'resource test' for inclusion of a transaction under the MLS

The resource test (type of resource being transferred): The germplasm being transferred must meet both of the following requirements:

- It is from a species within the categories of plant genetic resources for food and agriculture listed in Annex I to the Treaty; ***and***
- Either
  - It is (1) under the management and control of the Contracting Parties and (2) in the public domain;[81] ***or***
  - It is held by others who agree to include it in the Multilateral System; [82] ***or***
  - It is found in the *ex-situ* collections of the IARCs; [83] ***or***
  - It is found in other international institutions, which agree to be included in the MLS. [84]

77 A Material Transfer Agreement had been adopted by the CGIAR-coordinated IARCs a few years before the ITPGRFA was in force. Moore and Tymowsky, 2005, at 99.

78 Many non-IARC collections and researchers have objectives and desires that are nearly identical to those expressed by the ITPGRFA. As time passes, the implementation and understanding of the Treaty are expected to encompass the needs of nearly all collections and germplasm conservation activities.

79 ITPGRFA § 11.2.

80 ITPGRFA § 11.2. In § 11.3 the Contracting Parties expressly commit to encouraging these entities (both natural and legal persons) to avail themselves of this option. In 11.4, the Contracting Parties agreed that by June 2006 ('within two years of the entry into force of the Treaty') they would decide 'whether access shall continue to be facilitated to those natural and legal persons … that have not included these plant genetic resources for food and agriculture in the Multilateral System.' In other words, to close the system to all those who do not open their own collections to users under the MLS.

81 ITPGRFA § 11.5.

82 ITPGRFA § 11.5.

83 ITPGRFA § 12.2.

84 These provisions clearly demonstrate that laboratory procedures using modern biochemical technologies to create new varieties (GMOs or LMOs) are clearly within the scope of the ABS components of the ITPGRFA, where the new varieties are created as food or feed.

Box 3 The 'use test' for inclusion of a transaction under the MLS

User/use test: As a second mandatory element, the transfer/use situation must meet all of the following conditions:

- The user is a legal or natural person under the jurisdiction of any Contracting Party;[85] and
- Either
  - The resources will be used 'solely for the purpose of research, breeding and training for food and agriculture' and 'not … for chemical, pharmaceutical and/or other non-food/feed industrial uses';[86] or
  - In the case of 'multiple-use crops' (crops that meet the first part of (i), above, but are also used for non-food/feed uses), inclusion will be possible based on 'their importance for food security.'[87]

Where a transfer passes both tests, the Treaty predetermines many ABS rights and responsibilities relating to the use of the genetic material being transferred. There is no need (or possibility) for new ABS negotiations for each transfer.

Article 1.2 of the Treaty states that the objectives of the Treaty 'will be attained by closely linking this Treaty … to the Convention on Biological Diversity.' However, there are some aspects of the coverage question which have not yet been decided. In these aspects the precise relationship between the CBD and the ITPGRFA will still be determined by governments. In particular to clarify how ABS rules apply:

- where a company uses germplasm obtained through the ITPGRFA for non-agricultural products;
- where various kinds of germplasm are transferred in a single transaction;
- where germplasm is transferred that is not listed in the MLS; and
- where particular individuals transfer their own material that is not in the public domain;

and many other possibilities. It will also be necessary to consider how to integrate decisions of the ITPGRFA Governing Body, under ITPGRFA Article 12.3(h) into national ABS law and/or general provisions of law in member countries.

1.4.1.2 Implementation and enforcement

Regarding the critical issue of implementation and enforcement, the Treaty says that

> *Contracting Parties shall ensure that an opportunity to seek recourse is available, consistent with applicable jurisdictional requirements, under their legal systems, in case of contractual disputes arising under such MTAs, recognizing that obligations arising under such MTAs rest exclusively with the parties to those MTAs.*[88]

Beyond a generic call to enable enforcement, one implication of this provision is that enforcement actions could not be taken against the user country when the user (individual, company or entity) defaults or fails to comply with the MTA. Only the user will be responsible for that violation.

Connected to this, it will be essential to have some level of international agreement regarding the interpre-

85 ITPGRFA § 12.3(a).

86 ITPGRFA § 12.5.

87 For example, the Treaty provides both that 'the recipient of the plant genetic resources for food and agriculture shall require that the conditions of the MTA shall apply to the transfer of plant genetic resources for food and agriculture to another person or entity, as well as to any subsequent transfers of those plant genetic resources for food and agriculture' (§ 12.4) but also provides that '[a]ccess shall be accorded … without the need to track individual accessions' (§ 12.3(b).) The manner in which the former provision can be required, without any type of tracking, is still being determined.

88 ITPGRFA § 9.2.

tation and application of the Treaty. At present, some of the Treaty's provisions are still in the process of such interpretation,[89] with the goal of creating a streamlined process that eliminates needless delay and obstacles to the food and agriculture-related transfer and utilization of germplasm samples and other genetic resources.

1.4.1.3 Farmers' rights

Finally, in Article 9.2, the Treaty addresses another element which relates to the CBD and which is often closely related to ABS – the rights of traditional and indigenous communities. Its work in this connection extends to a different group, however, through the concept of 'farmers' rights':

> *each Contracting Party should, as appropriate, and subject to its national legislation, take measures to protect and promote Farmers' Rights, including (a) protection of traditional knowledge relevant to plant genetic resources for food and agriculture; (b) the right to equitably participate in sharing benefits arising from the utilization of plant genetic resources for food and agriculture; and (c) the right to participate in making decisions, at the national level, on matters related to the conservation and sustainable use of plant genetic resources for food and agriculture.*[90]

This provision extends beyond the CBD, by specifically identifying 'rights', including rights 'to equitably participate in sharing benefits' – beyond the CBD's provisions regarding traditional knowledge. This extension may be explained in terms of the text of the ITPGRFA. One essential difference between the Treaty and the CBD regarding benefit-sharing is its adoption of a broad-dissemination system for distribution of benefits, which does not require identification of the precise source of each genetic resource. In this way, the ITPGRFA negotiators made it easier for countries to provide specific 'right' to traditional, local and farmer communities to share in these generalized benefits.

1.4.2 Access concepts

Regarding access, the Treaty makes two specific statements applicable to all resources that meet the resource criteria, above,[91] regarding (i) the sovereign rights and duties of Parties; and (ii) emergency powers in times of food shortage.

1.4.2.1 National legislation and sovereignty

By executing the ITPGRFA, each Party specifically agrees that it will either:

(i) adopt special national legislation regarding 'access to plant genetic resources for food and agriculture found in in-situ conditions' or

(ii) allow any person to access those resources 'in accordance with such standards as may be set by the Governing Body.'[92]

This provision is essentially an agreement by all Parties to trade the individual exercise of their sovereign rights regarding access to their own PGRFA, in exchange for participation in the establishment and operation of the Multilateral System of Access and Benefit-sharing. By contrast, Article 15.5 of the CBD takes the opposite approach, requiring PIC from every country, unless the country specifically gives up its ABS rights.[93]

89 As the Parties integrate these points into their national law and practice, they may provide important lessons for other elements of national ABS implementation.

90 ITPGRFA § 12.3(h) 'Without prejudice to the other provisions under this Article, the Contracting Parties agree that access to plant genetic resources for food and agriculture found in *in-situ* conditions will be provided according to national legislation or, in the absence of such legislation, in accordance with such standards as may be set by the Governing Body.'

91 Discussed above, Art. 15.5 provides that 'access to genetic resources shall be subject to prior informed consent of the Contracting Party providing such resources, *unless otherwise determined by that Party*.' This means that, if the country does not specifically make a determination releasing or limiting its PIC rights, then the general law of that country will determine whether the country has given consent and what the terms of that consent are. By contrast, if a country is a Party to the ITPGRFA and has not adopted specific ITPGRFA-implementing national legislation which specifically addresses access to its PGRFA, the Treaty may adopt standards that will govern in that country.

92 ITPGRFA § 12.6.

93 The CBD's 19th preambular paragraph states that the Parties are 'Aware that conservation and sustainable use of biological diversity is of critical importance for meeting the food, health and other needs of the growing world population, for which purpose access to and sharing of both genetic resources and technologies are essential.'

1.4.2.2 Food shortage exception

The second critical ABS provision of the ITPGRFA relates to food shortages and other emergencies. The Treaty specifically states that

> *In emergency disaster situations, the Contracting Parties agree to provide facilitated access to appropriate plant genetic resources for food and agriculture in the Multilateral System for the purpose of contributing to the re-establishment of agricultural systems, in cooperation with disaster relief coordinators.*[94]

This provision will almost certainly be interpreted to dispense with ABS issues for PGRFA where an emergency exists. This provision does not appear to constitute an exception to coverage, however. The resources remain under the coverage of the ITPGRFA, but are excused from its procedures, during the time of the emergency. There is no parallel provision in the CBD regarding urgency, but the idea that special flexibility may be needed in emergencies would appear to be implicit in the Convention's preamble.[95]

1.4.3 Mutually agreed terms for acquiring plant germplasm

For many commentators, the most important provisions of the Treaty relate to the various provisions which eliminate contract-by-contract MAT negotiations for resources transferred through the MLS. Where a potential user meets the user criteria (box 3, above) and the germplasm sought meets the resource criteria (box 2 above), the MAT are pre-agreed. Regarding access to germplasm covered by the MLS, Parties to the ITPGRFA have specifically agreed in advance to the following Mutually Agreed Terms:

- All access to germplasm through the MLS will be under an agreed 'form contract'[96] – the Standard Material Transfer Agreement (SMTA);

- Persons, companies, and entities receiving plant germplasm through the MLS, 'shall not claim any intellectual property or other rights' over the material, its parts and components in the form received if such IPR claims could operate to limit other peoples facilitated access to same genetic resources;[97]

- If the specific 'plant genetic resources for food and agriculture' are protected by IPRs, the person providing them must ensure that access is 'consistent with relevant international agreements, and with relevant national laws.'[98]

Of these, the first point – use of the SMTA in all transactions – is most relevant to this book. The SMTA has had a major impact on ABS, with many countries recommending that all ABS negotiations follow the same path, adopting a single-form agreement, which eliminates the need for individual negotiations of ABS contracts. Some have even suggested that the SMTA should simply become the model for all ABS documentation.[99]

As further discussed in Chapter 3, the SMTA is already one of the best known 'ABS contracts'. Unlike other 'model contracts' that have been prepared or proposed, it has already been adopted by over 100 countries which are, in essence, the 'providers' of the PGRFA described in the MLS. Because of its importance, the SMTA's individual provisions will be discussed in detail in Chapter 3.

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94 The use of form contracts is discussed below in Chapter 3.

95 ITPGRFA § 12.3(d). In full that section provides that 'Recipients [of germplasm provided through the MLS] shall not claim any intellectual property or other rights that limit the facilitated access to the plant genetic resources for food and agriculture, or their genetic parts or components, in the form received from the Multilateral System.' This provision responds to the problem of patenting of natural genes, as set forth in the previous section. It does not, however, include any commitment under which Treaty Parties agree not to issue, recognize, or give legal effect to patents issued in violation of this term.

96 ITPGRFA § 12.3(f). Although not clear, this provision is usually assumed to refer to international laws governing 'intellectual and other property rights.' It must be noted, however, that all countries are already obligated to act in a manner consistent with the international laws they have ratified or accepted, and that this provision cannot operate to bind any country to international laws that they have not ratified or accepted.

97 *See,* e.g., *A de facto certificate of source - The Standard Material Transfer Agreement under the International Treaty,* (Bioversity International Policy Brief, January 2007).

98 This protects the user by ensuring that his rights to trade secrets (data, resources or technologies) are not in doubt, even if those secrets arose out of the germplasm obtained from the MLS. Since the country does not own that data, resources, or technologies, it cannot be forced to transfer them.

99 ITPGRFA § 13.1.

1.4.4 Pre-agreed benefit-sharing

The ITPGRFA and the SMTA also constitute a pre-agreement on the benefit-sharing obligations related to assets transferred through the MLS, eliminating individual negotiations on this point as well. The following sections briefly describe the two types of pre-agreed benefit-sharing under the SMTA – sharing at the country level and sharing at the individual level.

1.4.4.1 Benefit-sharing at the country level

Unlike CBD Article 15, the ITPGRFA's benefit-sharing obligations are the duty of each country that is Party to the Treaty. This is different from the CBD, which requires Parties to impose benefit-sharing requirements on its citizens and entities – the users – but does not require the countries to be responsible for benefit sharing.[100] At the country level, benefit sharing and access are basically identical. The Treaty specifically states that access to the MLS is itself 'a major benefit of the Multilateral System,' which is, by definition, shared fairly and equitably.[101] Connected to this, the Treaty requires all countries to provide benefits on a general level (i.e., without the need to identify particular source countries), in the form of –

- information,[102]
- 'access to technologies for the conservation, characterization, evaluation and use' of MLS crops,[103] (i.e., through the sharing of specific improved varieties.),
- the mutual responsibility for scientific and conservation development,[104] and
- commercial benefit-sharing through partnerships and collaboration.[105]

In this way, the Treaty identifies cooperation and access as the main benefits under the treaty. Participation in the treaty is a stepping stone to accessing this cooperation, and to promoting maintenance of the IARCs and other collections. This in turn benefits all users of those resources.

1.4.4.2 Benefit sharing in individual transactions

In addition to ITPGRFA's systemic benefits, the Treaty also imposes specific benefit-sharing obligations on each individual user. The Treaty consolidates and standardizes these obligations, by agreeing on three kinds of individual benefit sharing:

- Financial benefits of commercialization: Each user must either pay a specific share of its proceeds from commercial marketing of new varieties, or provide greater access to the resources they are using.
- Future access: when the Recipient 'conserves the Material supplied',[106] he is required to make it (and relevant passport data) available through the

100 Per ITPGRFA § 13.2 (a), all countries under an obligation to 'make available information … [including] catalogues and inventories, information on technologies, results of technical, scientific and socio-economic research, … characterization, evaluation and utilization, regarding' species within the crop categories listed in Annex I to the Treaty.

101 ITPGRFA § 13.2 (b). Like 13.1, this benefit is shared among all Treaty Parties. In this case, the Treaty specifically states that, with regard to developing countries and transitional economies, such sharing shall be 'under fair and most favourable terms, in particular in the case of technologies for use in conservation as well as technologies for the benefit of farmers… including on concessional and preferential terms where mutually agreed.' (Id., clause (iii).) In addition to requiring the recognition of 'adequate and effective protection of intellectual property rights,' it calls for this sharing to occur 'through partnerships in research and development under the Multilateral System.' This obligation specifically includes the transfer of technology 'through genetic material.' Id. at clause (i). Some elements of this obligation are also placed on the user, as described below. The Treaty defines 'genetic material' in Art. 2 as 'any material of plant origin, including reproductive and vegetative propagating material, containing functional units of heredity.' Thus, it shares in the more general ABS problem of trying to create a recognizable distinction between 'genetic material' and other material of plant origin.

102 ITPGRFA § 13.2 (c). This provision generally requires the Treaty Parties to 'give priority to' programmes and facilities for (i) scientific and technical education and training in conservation and sustainable use of PGRFA, (ii) conservation and sustainable use of PGRFA, and (iii) carrying out scientific research. Most important, these programs are to be conducted 'where possible, in developing countries and countries with economies in transition, in cooperation with institutions of such countries.

103 ITPGRFA §13.2(d)(i), which provides in full that 'The Contracting Parties agree, under the Multilateral System, to take measures in order to achieve commercial benefit-sharing, through the involvement of the private and public sectors in activities identified under this Article, through partnerships and collaboration, including with the private sector in developing countries and countries with economies in transition, in research and technology development.'

104 Presumably, a user is 'conserving the material' when he holds it in a genebank, herbarium, or other collection for future use.

105 SMTA Article 6.3.

106 ITPGRFA Art. 13.2(a), and (d)(ii); SMTA Article 6.9.

ITPGRFA mechanisms;[107] and

- Data/information sharing: the Recipient must make available through the ITPGRFA mechanisms 'all non-confidential information' from their R&D process. It is encouraged, but not required, to contribute a sample of the final variety to one of the IARCs, once any IPR has expired.[108]

Predictably, most of the attention to the Treaty's benefit-sharing provisions has focused on the payment requirements – the share of commercial benefits that the Recipient is required to pay into an international fund. The Treaty's most important innovations relating to this type of benefit sharing are (i) the ITPGRFA Fund itself and (ii) the 'available for unrestricted use' exception to the payment obligation.

[a] The International Fund

Article 19 specifically calls for the creation of an International Fund (herein the 'ITPGRFA Fund') to receive and distribute monetary benefit payments.[109] This approach resolves a very difficult problem relevant to applying ABS to the agricultural seed sector – the fact that most new varieties include contributions from an enormous number of species. Through the ITPGRFA Fund, the Treaty can function with no need to identify the particular countries' resources used in each new product.[110]

[b] Amounts to be shared

In Article 19, Treaty requires all users to make a payment into the Fund as benefit sharing for the resources used. The SMTA (as adopted and amended from time to time by the Governing Body) sets the amount of such payment, in relatively circular terms. At present, the basic rate is 'one point-one percent (1.1 %) of the Sales of the Product or Products less thirty percent (30%).'[111] Applying this language in practice, it appears that the payments must be 1.1% of 70% of gross sales of the product – in other words, 0.77% of total sales.

The SMTA allows Recipients (users) to choose an alternative payment option, under which they pay what the SMTA calls a 'discounted rate' of

> *'zero point five percent (0.5 %) of the Sales*[112] *of any Products and of the sales of any other products that are Plant Genetic Resources for Food and Agriculture belonging to the same crop, as set out in Annex 1 to the Treaty, to which the Material referred to in Annex 1 to this Agreement belong.'*[113]

On the surface, this option does not appear to provide a discount. In addition to requiring payment on all products within the same 'crop,' the discount rate provisions requires the user to pay this amount for a minimum of 10 years, regardless of whether the product(s) using the genetic material are still marketed. At the end of this period, the recipient has the option of switching to the primary rate (payable only on sales of the actual products that utilize the originally acquired material), or continuing to use the alternate rate for another 5 years. It is possible that the rules for applying this rate may clarify the reasons that a user might choose this alternative option. For example, it might offer benefits to companies with many MLS-connected products, especially those who prefer to limit the amount of detailed financial information that they make available to the public.

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107 ITPGRFA Art. 19.3f and *see* Art. 13.2(d)(ii).

108 In ABS discussions, agricultural specialists frequently note that a large number of different subspecies or varieties may be combined in the creation of any new variety, and that each of those parent varieties might themselves be the product of a suite of species or varieties.

109 SMTA Annex 2, and *see* Art. 6.7. For this purpose, the term 'sales' appears to refer to gross sales of the product.

110 Note that this clause does not mention a 30% holdback – the 5% figure is the final percentage.

111 SMTA Annex 3, and *see* Art. 6.11.

112 ITPGRFA §§ 13.3-13.5, 18, 19 and especially the Global Plan of Action, adopted at the 1996 the Leipzig International Technical Conference on Plant Genetic Resources.

113 ITPGRFA § 13.6.

114 Section 13.2(d)(ii) states in part that '*The Governing Body may, from time to time, review the levels of payment with a view to achieving fair and equitable sharing of benefits, and it may also assess, within a period of five years from the entry into force of this Treaty, whether the mandatory payment requirement in the MTA shall apply also in cases where such commercialized products are available without restriction to others for further research and breeding.*' The five-year period mentioned in this clause extended until 28 June 2009.

In addition to standardizing payment, the Treaty sets the criteria for use of the moneys in the Fund.[114] It opens a link to Food Processing Industries, by allowing and encouraging them to provide 'voluntary benefit-sharing contributions' to the MLS.'[115]

[c] Exception: Results 'available for unrestricted use'

The Treaty provides one significant exception to the basic payment requirement, through which are many users will be exempted from making any payments. It suggests that only a very small number of users will actually pay into the Fund at present, although this situation may change.[116]

This exception is contained in an SMTA provision that gives a user two options whenever he 'commercializes a product that is a plant genetic resource for food and agriculture and that incorporates material accessed from the Multilateral System.' Specifically, that user must either

- make that product is available without restriction to others for further research and breeding; or
- pay the specified amounts into the Fund as described above;[117]

A user can comply with the product availability provision, even where he commercially markets the variety created using germplasm from the MLS, and/or patents that variety. He may be excused from paying the specified amounts as to a commercially sold or patented variety as long as he is willing to provide samples of the product to other users (i.e., other variety developers) for research use in making their own products. He need not take specific action to promote this use, so long as he is willing to provide such samples upon request.

[d] Obligations of subsequent users

The first user's completion of a product also breaks the chain of benefit-sharing responsibility. If a subsequent user develops a product using the first user's product, he owes no benefit sharing.[118] He is encouraged, but specifically not required, either to make his product available without restriction, or make the relevant payment.

1.4.5 Next steps: Coordinating with the CBD regime

In the area of benefit sharing, as in the case of access, the primary remaining work for the ITPGRFA parties will be the task of ensuring 'harmony' in implementation. Although describing itself as 'in harmony with the CBD' at the international level, that statement only refers to the wording of the instrument. There are many ways in which national level implementation of the ITPGRFA might not be easily harmonized with national ABS policies, objectives, and implementation. Most important, as mentioned above, it will be essential to delineate the boundary between ITPGRFA's coverage and that of CBD Article 15.

1.5 Expectations

The future of ABS includes many possibilities for change, most of which are essential in order for ABS to become a functional system. Some of these changes may have a significant impact on existing contracts and current users. This state of legal uncertainty creates a serious problem for users, providers, and source countries. ABS contracts continue to be needed, and parties do not have time or willingness to wait for the results of multi-year negotia-

115 ITPGRFA §13.2(d)(ii).

116 Depending on which definition of 'derivative' is used, this provision might be seen as essentially eliminating derivatives from the coverage of the ITPGRFA.

117 Currently, the AHWG-ABS has been ordered to complete its work by 2010, if possible. Even if it meets this deadline, it is not clear whether the final product of the Group's work will be adopted in 2010, or whether additional formal negotiations will be needed. In addition, when the outputs of the regime negotiations (whatever they are) are finally adopted, a period of years may be required before they have been implemented in national law, administration, and practices. A good example of the time scale involved is the Cartagena Protocol to the CBD, which began discussions before the CBD was adopted. The Protocol was finally adopted in 2000, entered into force in 2002, and as of this writing (2008) still has not been legislatively implemented in most developing countries that are or would like to become party to the Protocol.

tions. In fact, for some companies, the current situation of legal uncertainty appears preferable to the creation of a clear and predictable regime. They may believe that they continue to have an advantage as long as the ABS concept is ambiguous. In practice, however, this ambiguity can be very negative to users as well as providers. Until source countries can have confidence in their legal remedies for ABS transactions, they will probably continue to insist on a high level of procedural and contractual protection measures, thereby increasing transaction costs, slowing the ABS process and negatively affecting the user's ability to obtain clearly enunciated legal certain rights in the genetic resources he obtains.

One possibility is that, where the ABS system becomes international, it will also become more rational and even streamlined. If countries adopt legislation governing the users under their jurisdiction and ensuring reasonable levels of benefit sharing, this may provide assurance to source countries, enabling them finally to rely on shared definitions, processes, and requirements. In building a provider-side system that integrates with user-side measures in the countries most active in bioprospecting and access, each country may contribute to rationalizing the entire concept internationally.

Most tellingly, in the authors' opinion, the greatest impediments to a functional ABS system arise out of the expectation that such a system can become functional through a regime consisting of mandatory measures – that is, laws requiring ABS compliance. As discussed in other publications, there are many nearly insoluble problems with these mandatory approaches. By contrast, the concept of an incentive-based or motivation approach offers many possibilities, particularly when incentive measures are combined with mandatory and oversight measures. One positive impact of this kind of approach would be that it could operate to reward ABS compliance, giving benefits or other competitive advantages to those who obtain ABS contracts and/or who share benefits with source countries. This would eliminate the "perverse incentive" of current ABS – that is, the incentive of most commercial entities and researchers to avoid the need for ABS compliance wherever possible.

Regardless of the ultimate impact of the regime negotiations, there is a need for guidance for individual negotiations and drafters who create new contracts between now and the completion and implementation of the international ABS regime. In Chapter 2, the legal issues and elements which make ABS contracts different from other contracts are discussed. Chapter 3 provides some examples of issues and specific clauses from the contracts that have been made accessible. It is hoped that the negotiators in the ABS regime discussions, as well as the parties to individual contracts, might benefit from this discussion, obtaining a better understanding of how contract law impacts on ABS and why contract law alone is not sufficient to make the ABS process functional.

2 Applying Contract Law to ABS

*Tomme Rosanne Young**

As noted above, it is not possible to provide a full discussion or even a rigorous summary of the principles of contract law. However, many persons within this book's target audience (persons responsible for negotiating, implementing, overseeing, legislating/regulating or otherwise understanding and acting in ways that relate to and impact ABS contracts), including both national and private sector negotiators, have asked for help in understanding how basic contract law applies in ABS contracts. They have defined a need of to understand how conventional contractual practices are altered by the unique characteristics and the uncertain legal situation of ABS.

Up to now, the response to this need has been limited, often dismissed with a few generic lines:

> *[t]he essential elements of any contract throughout the world include (i) competent parties able to be bound by the agreement through their representatives; (ii) meeting of the minds regarding the subject of the agreement – the understanding of what will be done or not done; (iii) mutual assent – a voluntary commitment to perform under the agreement; (iv) consideration – an exchange of valuable tangible things, money, promises or rights; (v) enforceability – the promises of the parties must comply with legal requirements.*[1]

From the lawyer's perspective, this simplification is correct and understandable. A contract lawyer would usually expect parties to obtain specialized help from experts in multinational contracts and relevant law when negotiating a contract that involves more than one national jurisdiction. In ABS, however, this expectation is not always met. Competent international commercial lawyers are costly and have limited time available. It may be difficult for a government official on a limited budget to obtain this kind of assistance, even if he has some funding for it.[2]

Once an international contract law expert has been hired, however, there is an additional problem. Experts in commercial law and commercial specialties usually do not have experience with or knowledge of ABS.[3] Where they need to research a new area, they must invest more time, and this creates an expense that must be borne by their clients. ABS research and writing has not, up to now, addressed or identified the rules, issues and concerns that will allow modern commercial lawyers to apply contract law to ABS, and vice versa.

This Chapter is designed as a first step toward filling this gap. It provides a brief discussion of 'general principles of contract law,'[4] but assumes (and strongly recom-

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1 Gollin, 2002. *See also* Laird, 1999 (providing a 3-page summary of 'what a contract must include' that omits any reference to or discussion of legal issues standards for functional legal instruments or contractual law obstacles to be addressed), and Tobin, 1999 (1-page listing of a few 'key contractual provisions' without reference to content of such provisions or legal issues underlying them.)

2 A country may have few locally available lawyers with significant experience in international commercial contracts, by comparison to the level of demand for their services. In the modern world of 'globalised trade' their time will be normally both expensive and overbooked by foreign and domestic companies who better recognise their need for qualified expert services.

3 As of 3 December 2007, the CBD's Roster of ABS Experts included 66 names from 13 countries, of which 32 are from Venezuela, 10 from Costa Rica, and a total of 9 from any European country (one from Czech Republic, two from European Commission, and six from Poland). No experts are listed from North America or Japan. Only 5 identify themselves as legal experts, while a few others' resumes indicate work in legal policy issues.

4 Most authors agree that such principles exist, but also note that they are not found in a single code of fixed rules and standards. Discussions of these principles are based on similarities and/or a common core of principles found in various countries' national contract law and practices. Farnsworth, 2006, at 903. Even within these principles, there is tremendous contract-law variation from country to country, including basic elements of the contractual framework. For example, some countries apply one set of contract laws to 'commercial' transactions and a separate set for 'civil.' Tallon, 1983; and Zimmerman, 2005. In countries using these categories, the dividing line between 'commercial' and 'civil' differs from one to the next. This presents a special challenge for ABS – a new legal theory whose categorization is not yet clear. It may be impossible in those countries to know which law applies to an ABS transaction.

mends) that the reader will obtain further guidance from other qualified people and informational resources to address these issues. Rather than attempting to mention every contract law issue or component, it looks only at those legal issues which present the clearest initial challenges for ABS,[5] which are, broadly: (i) legal certainty; (ii) the functional mechanism of contracts; (iii) the specific requirements and formalities that make a contract legally valid; (iv) the elements that make a contract 'binding'; (v) contract types and terminology; (vi) assignment and transfers of contracts; (vii) third party rights; and (viii) special issues for international contracts.

2.1 Legal Certainty – a primary objective of all contracts

The question of 'legal certainty' has been raised in the ABS negotiations, primarily as an issue of great concern to the users, seeking assurance that they will be legally authorized to use the resources, after they have complied with PIC and MAT requirements. The issue is of equal importance, however, for providers concerned that they have legal certainty regarding the rights and expectations that they have been promised under the contract.[6] Both sides seek legal certainty through contracts (formal, enforceable mutual assurance about the other party's commitments and their own expectations).

The benefits of legal certainty do not depend on courts or legal action. In general a contract will only function if all parties have a 'meeting of the minds' about their mutual rights and duties. If the parties have certainty about the contract, they will incur fewer costs, risks and delays to resolve misunderstandings at later stages.

The following brief discussion describes the role of contracts in addressing uncertainty. It then considers the certainties and uncertainties of ABS contracts, and the manner in which contract law can help in addressing them.

2.1.1 Contractual certainty in general

In its earliest form, the contractual relationship was very simple – one person sells something he owns to another person willing to pay for it. The money and the item both change hands immediately, after which, the commercial relationship between the two parties is completed and terminated, without any written contract.[7] This type of transaction is still found in today's in retail stores and markets, for example.

As commercial relationships, products and concepts became more complicated, however, it became necessary to develop a system that would increase certainty and decrease the chance of misunderstanding over a longer transaction or series of repeated transactions. Written contracts were increasingly needed.

This evolution, however, demonstrates that even written promises may not always be enough to provide legal certainty. To be enforceable – that is, to give the parties certainty that their contracts will be performed – the contract must fit into national and international legal frameworks that apply in case of a violation or other problem. The framework of contract law benefits the parties, even if the contract never comes before a court. By knowing how an impartial judge would view a contract's provisions, the parties are better able to write a contracts in which every party is 'legally certain' about what is required. This can minimize the chance that the parties will ever need to go to court.

Contract interpretation can never be absolutely certain. No two situations are identical – even if the same parties enter into a series of identical contracts, the two contracts are different in time, and may encounter a new fact, condition or problem that is not addressed in the agreement. The existence of a clear and rigorous legal

5 As noted in the Introduction to this Part, one cannot generally provide 'black letter' legal analysis of basic contractual principles relevant to ABS contracts, due to the volume and variability of contract law. Each country's basic contract law is set forth and analyzed in a large body of legal writing. Application of each country's existing contract law to ABS will require careful detailed analysis. Only after this has happened can general principles based on existing law be determined.

6 CBD-related research and attention to this issue is summarised in Young, 2005a.

7 A large proportion of national contract law is still focuses on the rules for this type of transaction. The evolution of their national law to address longer-term contracts, including distribution and sourcing contracts, is still ongoing. *See* Visser 't Hooft, 2002, at 23.

system helps contract parties and negotiators make reasonable determinations about the interpretation of each provision when new situations arise. Negotiators also rely on the legal certainty of contract law, in estimating the commercial and legal risk that they accept in entering into any contract. Contract certainty cannot eliminate the risk, but it enables companies to make sound commercial decisions.

2.1.2 Legal uncertainty in ABS

As discussed in other books in this Series, the ABS regime has in the past suffered from a wide range of uncertainty problems. Some of these uncertainties may be resolved through the international regime,[8] but it is not likely that all will be addressed.

Contract law and the contracts themselves offer the primary hope of legal certainty in ABS, especially (i) the impact of ABS on contracts (i.e., how does ABS protect source countries and what does it provide to users?) and (ii) the meaning and nature of the ABS concept and its components (i.e., what are 'genetic resources' and how are they included in ABS?) In addition, each transaction may raise its own uncertainties (i.e., how will the contract be enforced, if some of its parties do not feel that ABS requirements have been met?) Many legal aspects of ABS are uncertain.

The following paragraphs describe some of these ABS uncertainties, and the role of ABS contracts in addressing them.

2.1.2.1 Legislative, procedural and practical uncertainties

Initially, the main legal uncertainties in ABS were raised by users whose concerns focused on national provider-side ABS law. Some users noted that compliance with these laws often does not provide legal certainty about the genetic resources. Users who make no attempt to comply with ABS requirements are sometimes in a better position, both financially and practically, than those who do comply. Delays caused by long administrative processes are both costly and may lead to a competitive disadvantage. In addition, some users think that complying with national ABS processes and public participation increase the chance that they will be singled out for negative action or bad press.[9]

Legal certainty is also a concern of source countries and other providers, as well. They are concerned that (i) there is no legal basis for enforcing ABS rights once the genetic resources are taken to a user country; and (ii) many who utilize genetic resources may not get permission from the source country.

To date, proposals for legal certainty in ABS focus on *alleviating impacts* rather than *addressing the causes* of uncertainty. Users call on source countries to streamline and/or relax their requirements and to give positive political support to users.[10] On the other hand, source countries seek to limit physical access to genetic resources and to control collection. They have tried to do this by imposing more intensive legal requirements – the opposite of streamlining.[11] The result is an un-winnable debate

8 Following the adoption of the regime, however, its provisions will probably need to be implemented by national legislation and administration.

9 Claims of 'biopiracy' and other misappropriation of genetic resources are difficult to prove. They are most commonly raised where public participation requirements have made individuals, NGOs and communities aware that the user is accessing their country's resources. Hence, many claim that a user who has attempted to obtain ABS permission is more likely to be the object of a claim of 'biopiracy' than a user who did not make any such attempt (and whose actions may not be known.) Young, 2005a,

10 *See*, e.g., the Bonn Guidelines at §§ 13, 33, and Ten Kate and Laird 2002.

11 This control issue is discussed in Fernández, 2007. As a consequence of their uncertainties, provider and source countries have imposed stricter responsibilities on the initial phases of the transaction (negotiations, public participation, PIC and MAT) over which they have control, hoping that this will to increase the protection for their genetic resources, and will have some non-legal effect after the user, his assets and the genetic resources are beyond the source country's jurisdiction. (*see also* Tvedt and Young, 2007 at Ch 3.)

In addition, tightened control of in-country collection processes creates a 'research squeeze' limiting action by researchers are often operating on small budgets and have no intention of obtaining commercial benefit from their work. Accordingly, many researchers, botanical collections and research institutions strongly propose that their work should be subject to an exception. *See,* Davis, K., 2007, Biber-Klemm, 2007, Demeth, 2007, and Gröger, 2007. By contrast, many high-profile allegations of 'biopiracy' or misappropriation of genetic resources are directed at situations in which the genetic resources were originally removed from the source country under a non-commercial research project or permission. Young, 2006a. A 'research exception' would be functional if it could ensure that the researcher/collector passes through complete ABS requirements when it transfers the resources. (Schindel, 2008.)

between the advocates of increased ABS legal protection (to enhance legal certainty) and opponents claiming that legal measures actually diminish legal certainty.

One root of the problem is the fact that few countries have adopted any ABS measures and of those, only one (Japan) has adopted any measures address the 'user side' of ABS (although not expressed as binding law.)[12] The lack of user-side measures creates a contractual imbalance. If the law is available and applicable only for one half of the contract with the other half unregulated, then the purpose of the entire contract (to give both sides legal certainty about their rights and obligations) is eliminated. A contract that is unenforceable in the user country is, at best, a general statement of 'good faith' – that responsible users will comply with its terms and conditions; but if they do not, the provider has no formal recourse.

Another contractual uncertainty in ABS arises from the fact that few countries have adopted any legal provisions or precedents integrating ABS with national contract law. Most countries, for example, apply different laws to different categories of contract. For example, many countries apply one set of laws to 'commercial' contracts and enterprises and a separate set to 'civil' contracts and enterprises.[13] To date, no country has specifically determined which set of rules apply to ABS contracts. Similarly, the laws governing property and property-related contracts can only be applied if you know what type of property 'genetic resources' are. At present, one cannot be certain in any country whether genetic resources are governed by the law of 'real property' (land), movable property, severable property (crops, timber, etc.) intellectual property, common property, intangible property or national patrimony/government property.

Even after these basic classifications are settled, it will be necessary to determine how the special nature of the 'ABS contract' will be reflected in law. Article 15 seems to expect that ABS contracts will receive special consideration (sometimes called 'user measures') in foreign countries that are CBD Parties. For such measures to apply, however, it must be possible to distinguish an ABS contract from any other contracts. As noted in Chapter 3, many contracts carefully avoid calling themselves 'ABS contracts' or making any reference to ABS terminology. It will be necessary to develop some basic system enabling countries that have adopted user measures to identify 'ABS contracts'.[14]

In light of the number and complexity of these deficiencies, it appears that the best (and perhaps only) way to create a *reasonable* legally certain system will be contractual. The contract (and contract law) must provide reciprocal, legally recognized and functional mechanisms, enforceable in every country in which the genetic resources will be collected, held or used.[15]

2.1.2.2 Conceptual uncertainty

From a legal perspective, the ABS regime is not yet functional. The ABS provisions in the CBD are written as policy objectives. They do not contain the kind of specific and focused legal language that the courts need in order to function. Clearer descriptions are needed in order to create a functional ABS commercial process. Concepts found in the Convention, such as

- 'access to genetic resources';
- 'benefits arising from utilization of genetic resources';

12 The lack of 'user-side measures' is discussed in detail in Tvedt and Young, 2007, at chapter 3.

13 This distinction is relatively common in some civil law countries, although the nature of these distinctions cannot be predicted from one country to another. Discussed in Tallon, 1983; and Zimmerman, 2005. For another discussion, *see* Farnsworth, 2006, at 906-908. In Germanic (civil law) countries this distinction is based on the nature of the parties and the activities within the contract – whether they are 'merchants' and 'mercantile enterprises.' In Roman law countries (civil law countries deriving practices more directly from Roman law and the Code Napoleon) the question sometimes turns on whether a the agreement concerns a 'mercantile act.' In common law, this distinction is not made where the same contract law applies to all, however, additional special provisions apply to some types of contracts (for the sale of goods, chattel leases, etc.)

14 Many negotiators and commentators in AHWG-4, 5 and 6 have suggested that contracts executed before the CBD negotiations began should be considered as 'ABS contracts. If this designation is to have a legal function, it will be necessary to create some standard for determining what a contract must address/contain, in order to be deemed an 'ABS Contract,' and to determine which practices of industry, research, and inter-community integration that will apply to ABS contracts. This can be answered only based on the particular law of the countries involved, the particular sectors and resources involved, and many other factors.

15 Every country includes some users. *See* Fowler *et al.,* 2001. Thus, every CBD Contracting Party, whether developed or developing, is obliged under Article 15.7 to adopt user measures.

- 'country of origin';
- 'country providing genetic resources';
- 'genetic resources'; and
- 'utilisation of genetic resources'

are not precisely explained or agreed. Even where there are CBD definitions (genetic resources, country providing genetic resources), those definitions are imprecise and ambiguous. They do not contain the kind of descriptions and explanations that a court or arbitrator would need to enable them to apply the law. Other concepts that used in ABS discussions and laws, such as 'derivative,' 'misappropriation,' and 'non-commercial research' are also unclear in the Convention and were not agreed within the original CBD negotiations. This book will not discuss the issue of ABS regime definitions,[16] or the various proposals for addressing them. The following paragraphs will instead briefly consider how these uncertainties affect (and can be affected by) ABS contracts.

A court, arbitrator or agency can interpret, apply, or enforce an 'ABS contract' only if that contract is legally 'unambiguous' – that is, if its terms are clearly stated and there are clear laws on any points on which the contract was silent. Courts[17] normally resolve conceptual disputes and ambiguities first by examining the specific language of the contract. Where a contract use legal terms without defining them or with ambiguous definitions, the courts can either declare the contract to be 'invalid' or use other sources of guidance to resolve the ambiguity. These possibilities create legal uncertainty that affects the contract from the earliest negotiations. If there is legal uncertainty about how the contract will be interpreted (what will be required), the Parties may be unable to assess its commercial, legal and practical risks or those of any particular provision(s) of the contract.

In many countries, the courts have many options (discussed in later sections of this chapter) for resolving ambiguities and uncertainties in the contract. They may determine that the contract is not valid and release the parties from responsibility, where that is the fairest option. In other cases, the court may turn to other national law (contract law and caselaw) and pre-contract negotiations to help clarify the meaning of particular provisions. Many countries' national contract law defines basic contractual and commercial terms and concepts. Those definitions will usually apply only where *either* (i) the parties specifically agree to adopt them, *or* (ii) the contract is silent (or ambiguous) on the term or concept. This important tool is generally not available yet as to ABS terms and concepts. It is important for the contract to be clear and unambiguous as to the issues and definitions mentioned above, as well as the precise obligations and rights of the parties.

In some situations, a court or arbitrator will also have the power to review evidence and testimony about the negotiations, in order to understand what the Parties believed and intended at the time they entered into the contract. At law, there are normally legal limits on the court's legal ability to receive and consider this type of evidence.

Where the user obtains physical specimens from *ex-situ* collections or other locations outside of their 'country of origin,' other questions arise.[18] Different countries have very different views about whether and how benefit-sharing applies to collections in 'intermediate countries' (as defined in this book) in addition to or in lieu of the original source country.[19]

16 These issues are well discussed in other publications, including the other books in The ABS Series.

17 As noted, contractual relations are often based on the parties' view of 'what a court would do.' They can best obtain legal certainty when their contract is drafted to meet the court's standards. Although most contracts are never examined by any court, if both parties conform to accepted legal and contractual standards, the parties can be more legally certain regarding their own rights and duties, and their expectations from the other party.

18 Since most species are distributed over more than one country, there may be multiple 'countries of origin' for each. Similarly, the origin of traditionally derived agricultural varieties is the country in which it developed its 'distinctive properties' although such varieties too are often disseminated across a wide area. Finally, similar species may share similar 'distinctive properties' of interest to researchers.

19 The CBD speaks of benefit-sharing with the 'country of origin of the genetic resources' – the source country (in the parlance of this Part) unless another country is *ex-situ* holder and can demonstrate that it has 'acquired the genetic resource in accordance with the CBD.' CBD, Art. 15.3, discussed above. The standards for proving such an acquisition are not yet agreed. If it has happened, the acquiring country would be considered a 'secondary source' country (as used in this Part).

2.1.3 Inter-sectoral uncertainties

A third ABS uncertainty arises from uncertainty about when an 'ABS contract' is needed, and when a conventional contract for material transfer is sufficient. If an ABS contract is legally required, but a conventional contract is used (without reference to ABS), then other questions arise:

Does ABS law apply to that transaction?

What rules apply to later transfers of the material to a party who uses its genetic resources? [20]

To avoid unintended violation, it is important to ensure that the contract (i) fully complies with relevant ABS requirements, and (ii) states exactly which rights the user has obtained.

2.2 The contract mechanism and the forces that control why/how it functions

Contract law is not a solution to all legal problems and commercial needs. The contract mechanism is non-coercive – that is, nobody is ever *required* to enter into a contract. Hence, by itself, it cannot be used to require any behavior or action. It is very useful, however, in situations in which a person wants to *voluntarily* bind himself to specific commitments. Once a contract is formalized, however, its parties intend to be legally bound to commitments, limits and responsibilities contained in the document. This suggests that a contract-based mechanism is only one part of the legal regime that would ensure that genetic-resource users comply with ABS requirements.

Such a regime must be driven by the *reasons* that a person would choose to enter a binding contract. In creating a conventional contract and in analyzing the use of such contracts, one need not normally ask

'What causes a person to enter into a contract?'

because the answer is obvious.[21] The ABS regime, however, seeks to apply contract law in a way that drastically alters the forces that cause contracts to function. Thus, for ABS contract analysis, it is necessary to consider the three basic forces that make the contract system work: (i) control, (ii) motivation and (iii) value.[22] The next sections examine those forces, and the nature of their impact on ABS.

2.2.1 Control

If a party can legally get what he wants without a contract, he will generally prefer to do so. The question of *control* focuses on whether a person or company has control over the specific property, services, collaboration or other rights that are the subject of the contract (such property, services and rights are called the '*res*' of the contract).

In normal contractual circumstances, legal control over the *res* is clear: A contract is necessary where one person wants to use or acquire a specific *res* and that *res* belongs to another or is under his (exclusive) control.[23] If you want a *res* which is owned by another party, you must either get permission (a contract) from that party or find another source. Once a valid contract ex-

20 Some ABS laws require an ABS contract for any transaction involving genetic resources; others do not. This inconsistency among countries creates a high level of uncertainty for the parties. *See* Young 2006a. In some cases, claims of 'biopiracy' are asserted where a valid contract for material transfer has been granted, claiming that this grant violates law or equity. Discussions in the international regime negotiations propose creating a unified definition of 'misappropriation of genetic resources.' If adopted, this approach could solve two problems, increasing certainty and eliminating one of the main obstacles that has prevented countries from adopting 'user-side' ABS measures.

21 Few ABS discussions have focused on the fact that 'exchange is the mainspring of any economic system that relies on free enterprise.' *See,* e.g., Farnsworth, 2006, at 905.

22 The following discussion draws significantly from the theoretical constructs and analysis found in Macneil, 1980.

23 In countries using code napoleon or Roman legal systems, this question is well understood under a principle of patrimony. Oversimplified, this concept says that each person has a patrimony (which might be considered 'legal control') over those things which are his own. He can divest or transfer his patrimony only through a legal action (a 'juridical act.') Klimas, 2006, at 6.

ists, it creates mutual types of control. The parties must either comply with the contract or agree to terminate it. Either party will be liable for remedies, penalties and other claims if he fails to comply.[24]

There are some commodities (air, airwaves, sunshine, etc.) that are not under any person's legal control – they are free for the taking. These can sometimes be converted into private, sellable property either by individual action (a shop which fills air tanks for divers) or by governmental action (laws which require a permit in order to use particular television- or radio-broadcast frequencies.)

Overall, 'control' in contract law can be expressed by a simple question:

> *'Does someone or some person or agency have legal control over this* res*?'*

The answers to this question differ, depending on what kind of *res* is involved. It is possible to identify several categories of property, based on how they are controlled. Although this is a complicated discussion,[25] a simple summary of these categories can be provided. Property may be:

(i) un-owned, but ownable (e.g. the natural sources of freshwater);

(ii) un-ownable (e.g., sunshine (in most cases));

(iii) national patrimony;

(iv) community-owned;

(v) owned by possession (e.g., most kinds of movable personal property); and

(vi) owned by documentation (e.g. shares in companies, cars, land), etc.

The rules that govern ownership, control and transfer of any property will vary depending on which category of property is involved. This is difficult in the ABS context, because it is not clear which category applies to ABS.

The ABS system is based on the assumption that genetic resources can be transferred by contract. If this is true, then genetic resources must be a kind of property that is ownable and under the control of a country, community, person or entity that has the power to enter into ABS contracts. This in turn means that one who proposes to use a specific genetic resource must be able to answer the question '*who controls this genetic resource?*'

The contract is valid only when the party who is transferring the resource has legal control of it. It is difficult to know this, in light of the nature of genetic resources. Every specimen of a species possesses some genetic material that is common to all members of species, and other genetic material that is shared only with a smaller group of specimens or perhaps unique to that individual. Even when the specimen is individually owned, each of its shared genetic resources is owned by many different owners, communities or countries. There may be thousands of individuals who separately own the identical genetic resource. This range of possibilities continues to expand the more one thinks about it. For example, a particular gene-linked characteristic may be shared among all varieties his species, or even among other species within the same taxonomic genus or family. Other examples from real-life situations are equally difficult. Recently, for example, users that have identified specific genetic resources from enzymes found in dung samples, and have claimed that any person legally in possession of dung containing the enzyme has a right to the enzyme's genetic resources regardless of the source of the dung.[26] This leads to the 'paradox' in Chapter 1 and increases contractual uncertainty.

A related problem in ABS is the prevalent belief that a country or community can *control* genetic resources or traditional knowledge – i.e., prevent anyone from obtaining samples. It may be unreasonable to expect any government to prevent access, given that there may be

24 Even in countries known to be 'litigation-avoiding', the contract system creates a type of claim and obligation that is normally worthwhile only where it will produce some practical benefit or return to all parties. *See*, e.g., JAPAN: Civil Code, Art. 1, §§ 2-3, which requires that 'the exercise of (contractual) rights and performance of (contractual) duties shall be done in good faith and in accordance with the principles of trust,' and that 'no abuse of rights is permissible.'

25 CBD Secretariat, 2007b.

26 Personal communication with R. Lettington, April 2005. Documents of the discussions of this issue were not at that time made publicly available.

thousands, millions or billions of samples of each subspecies in existence. There is little chance that any country can physically prevent a user from obtaining one or more specimens. Once the user has obtained biological specimens, there is even less chance that the user or provider can prevent the specimen collector from removing testing or other use of that material.

Strict control of genetic resources may be technically impossible. Each country would have to catalogue specific genetic samples of every genetic resource within their country.[27] If that database were available, it could only be used to enforce ABS if (i) all national databases are interlinked, (ii) every contract granting genetic resources is recorded in that database, and (iii) the country can obtain a sample every sample being researched, every product or every other use of genetic resources. It must test and compare to the database to determine the source of genetic material or information.

The same is true of traditional knowledge, which is often held by more than one individual, and transferred through rituals or practices. It may be unreasonable to try to 'control' such knowledge – that is, to prevent other persons from being aware of it, or obtaining descriptions or accounts of it.

Rather than controlling them, it seems easier, legally and practically, to develop a system for controlling the *right to utilize* genetic resources or traditional knowledge.[28] Attempts at controlling samples or knowledge have been relatively unsuccessful and are usually dependent on whether the holder of the protected species, genetic resources or knowledge has enough money and other support to enforce the controls himself.[29]

In addition to IPRs, there are many other potentially applicable examples of legal systems to control rights of use. For example, many countries control rights to the 'airwaves.' Although the *physical* right to control the airwaves does not exist, the legal right has been created. A particular company obtains a license to broadcast television, radio or other signals on a particular frequency, for example. The licensing agency has the absolute ability to oversee those who are using the airwaves. Most important, violations of this control are easy to identify – 'misappropriation of the airwaves' will always be observable by any person with a radio, television or other receiver tuned to the controlled frequency.

This kind of observability is not normally possible in ABS situations. It is virtually impossible for the provider or source of genetic resources to know when and how they have been utilized. A user may have dozens of ways to obtain samples of the physical material that are outside of the source country's oversight. Once he obtains the physical material, his research and development activities will happen away from scrutiny, in a laboratory which may be private property, and in a commercial situation which focuses significant attention on maintaining confidentiality and protecting ongoing research and other trade secrets. When a product is produced, it may be impossible for anyone to determine the actual source of all materials used in the final product or in the processes that produced it. The lack of physical control over the resources is clearly one way in which ABS contracts are different from other types of contracts.

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27 This approach is exemplified in Costa Rica's *Instituto Nacional de Biodiversidad* (InBio), which has over the past 25 years amassed a very large database and material collection of all or nearly all members of certain phyla present within the Country. *See* www.inbio.ac.cr.

28 *See,* e.g., Tvedt & Young, 2007, at 4.1.2, for a more detailed analysis of the reasons that it is legally easier to control 'rights to utilize genetic resources' than it is to control the resources themselves. In addition, in 3.5 and 6.2, that book notes that ABS enforcement difficulties are so great that the most practical approach to an ABS regime may be one that relies on the adoption of sufficiently strong incentive measures.

29 Frequent mention of intellectual property rights as a pattern for ABS often ignores two facts: (i) the holders of intellectual property are currently facing severe challenges from 'pirates' in other countries who make and sell 'knock-offs' of property containing patented or copyrighted information; and (ii) IPR enforcement is primarily dependent on actions by the person holding the patent/trademark/copy rights, suggesting that the high cost of filing and maintaining an IPR is relatively small compared with the cost of defending it. Bentley and Sherman, 2004.

2.2.2 Motivation

Another force necessary to the functionality of the commercial contract system is motivation. In essence, the motivation issue asks

> *When does the motivation to take on contractual responsibilities outweigh the limitations imposed by the contract?*

Motivation to enter a contract is usually commercial, based on all options, including the no-contract option. Since it is usually not possible to tightly control the collection of biological samples, importance of *motivation* may be critical to making ABS work.

The simplest motivation is need. If the *res* is controlled by some person or entity, and another party *needs* that *res* for some important purpose, a contract will be his only solution. Consider, for example, a builder who has promised to build a house of wood and stone: to do this, he *needs* wood, stone and other building materials and supplies. If they are owned or ownable, the builder must either get either a resource contract (direct permission to cut trees in the forest, and quarry stone in the mountains), or a purchase contract with someone who already possesses lumber and quarried stone. There are many secondary kinds of motivation. The builder may have committed to a particular type or quality of lumber, for example. The choice between suppliers may be based on legal requirements, where the law limits importation or use of wood from certain species. Motivation may also derive from quality concerns, where some types of materials are known to be better, more lasting, or otherwise higher in quality.

In ABS, the normal motivation to enter into a contract is need. It may be diminished by the ABS uncertainty problems described above – one can obtain specimens of nearly any species,[30] or of traditional knowledge without going to the source country's government. Hence, he may feel no incentive to enter an ABS contract.

ABS is expected to rely on another motivation – social responsibility. This kind of motivation is parallel to modern social-responsibility certification, such as where the ultimate buyers desire a product that is certified or labeled to meet social or environmental standards.[31] A difficulty for ABS, however, is the fact that ABS and genetic resource issues are not matters of general interest or awareness among consumers. Even in industries that utilize genetic resources, few people understand ABS or know why they should care about it.[32] Discussions of ABS are rare and opinions range from support to open opposition. Even if the world unites in support of ABS, it would be impossible for a consumer or commercial user to know whether a particular item was created using 'genetic resources' and where those resources came from.

It may be impossible to create a verifiable 'ABS label'; however, efforts are underway to integrate ABS compliance into other ethical labeling standards. Work in the BioTrade initiative,[33] for example, seeks to identify a range of good sourcing practices for products from developing countries and communities, with the hope that these can be integrated into existing social/environmental/ethical certification systems such as FairTrade and the Forest Stewardship Council. These efforts are ultimately expected to go a step further, identifying standards of good practice for companies that engage in direct contracts for biological materials in developing countries.

With the question of 'control' already doubtful, the primary motivations for entering into an ABS contract are (i) compliance with source-country law and (ii) encouragement from the user's own country. In general, neither of these motivations is currently strong. Many

30 Even the rarest endemic species can be found in collections around the world. Many important genetic resources are available on local markets as food or medicines. Physical samples can be legally obtained from such locations without a permit.

31 A desired label may relate to the type or source of the material (e.g., 'Hoodia from Southern Africa'), or 'ethically sourced (e.g., 'purchased from the San people'). Eventually this desire leads to certification like the Forest Stewardship Council's forest product labels. *See* Young 2006b.

32 This lack of understanding is graphically demonstrated by recent user surveys in Germany, Belgium and UK. *See,* Latorre, 2005; Holm-Müller *et al.*, 2005 and Dedeurwaerdare, 2006

33 Current activities and outputs of the BioTrade initiative on benefit-sharing can be found online at http://www.biotrade.org/BTFP/BS/Benefit-sharing.htm.

34 Henkel, 2006. *See generally,* Young, 2005a.

users have simply stated that they will avoid ABS, by acquiring all resources (no matter what origin) from persons and entities outside of the specimen's country of origin – i.e., from middlemen.[34]

Consequently, it seems very important for the ABS regime to focus on developing commercial motivation mechanisms, which inspire users to participate in ABS contracts. There are many pathways for the creation of commercial motivation where none exists. 'Legal and commercial incentives' may be developed, by user countries or in other ways, to encourage ABS compliance.[35]

2.2.3 Value

Value serves as a motivation of a contract in a very clear way. The parties to a contract must value what they are receiving more than what they are giving. For this purpose, 'value' is far more than just financial return. Other kinds of value include public opinion, future expectations, competitive advantage and access to specialized markets. The existence of the contract itself may have value, for example, where public awareness of the contract creates a basis for improved public relations.

Value motivations in the ABS system have been explored intensively. Analysts presume that value is the primary factor in determining whether an ABS contract will be negotiated and with whom. To date, however, most of the discussions of value in ABS focus on the value of specific genetic resources, especially the 'use value' of those resources, and the value of benefit-sharing received by countries and other providers to date. In both cases, these studies claim that value information suggests that ABS is not needed or cannot provide enough value to be worth the effort of creating the ABS regime.

There are many other potential sources of value or value enhancement in most material contracts that are not always present in ABS. One of these is the value of long-term prospects (i.e., transactions that involves or creates a continuing supplier relationship.) In some (but not all) ABS situations, however, users seek to synthesize or otherwise replicate the genetic or biochemical properties of the original samples, after which no additional natural material will be needed. Product development in some sectors may take decades, however, and in some cases require multiple re-sourcing of the original genetic material.[36]

ABS discussions have raised financial issues in another context as well – the costs of agency and other processes under ABS. Source countries sometimes impose time-consuming and expensive administrative processes on applications for ABS contracts. Many ABS commentators claim that high transaction costs have a serious negative impact on the value they receive and are perverse incentive to ABS contracts, perhaps even encouraging the user to avoid ABS compliance. At minimum, a user who feels that the 'transaction costs' are too high, may refrain from negotiations with the country, and or seek to fill his need elsewhere.

The reasonableness of administrative costs, however, must also be determined from the perspective of the source country, which may not be able to achieve other necessary objectives (e.g., protection against misappropriation) in any other way. To them the value of administrative protections must be calculated by considering the value of the interests protected, rather than by looking at the use value of the resources in the hands of the user.

2.2.4 Summary

Many of the normal factors which induce parties to enter binding and enforceable contracts are not strongly present in the ABS context. Hence, ABS contracts sometimes do not function in the same way as other commercial contracts. The negotiators, parties, courts, arbitrators, mediators, and supervisory bodies dealing with ABS contracts may find it difficult, impractical or unfair to automatically apply normal contractual rationales and expectations to ABS Contracts.

35 This issue is discussed in Tvedt and Young, 2007, at 2.7.4, 3.5, 6.1 and 6.2.

36 The time estimates for commercial product development from genetic resources vary by sector. Estimates in the pharmaceutical sector are usually between one and four decades.

At the same time, many parties to ABS contracts (reasonably) expect that an ABS contract will offer the level of legal certainty regarding the rights obtained and ensuring that those rights are legally final and cannot be overturned.[37] It is essential, therefore, to build a body of 'general practice' in ABS, which can provide a basis for creation, operation and enforcement of ABS contracts. This book assumes that the goal for ABS contracts is to function as much like other contracts as possible, while ensuring that access is fairly granted and benefits are equitably shared.

2.3 Contract validity: Requirements, governing law and formalities

Legally, the first milestone in contract creation is 'validity' – whether the parties have formed a legal contract or merely a statement of intent.[38] This determination rests on four legal principles:

- the contractual law governing 'validity';
- special legal exceptions that protect parties who 'relied' on the document (whether or not it was a contract);
- the 'contractual formalities' and their underlying purpose; and
- the designation of 'governing law' under the contract.

In ABS, these questions are particularly important because (i) all ABS contracts have 'transborder' impacts (every ABS contract involves at least two different countries); (ii) the basic functions and interpretation of ABS contracts are not well established and are ambiguous in some respects; and (iii) the provider (or some of the providers) may be traditional or rural communities or individuals.

2.3.1 Requirements of a 'valid contract'

In general, a contract is 'valid' when it is recognized as a legal instrument by the courts and other legal processes. It is the first step in determining whether the contract's provisions are 'binding' or 'enforceable' (2.4, below). There are up to four 'threshold' elements of validity.' Specifically, validity requires that both parties

- had the legal control over the *res* of the contract;
- were legally competent when they entered into the contract;
- did not defraud or deceive the other (and met their legal duties to disclose relevant information);
- complied with any relevant statutes to protect some types of parties (e.g., consumers, children and communities with fewer resources)
- satisfied the rules governing special types of contracts (e.g., property transfers, credit contracts, etc.) have been complied with.

The basic rules and their application are summarized below.

2.3.1.1 Legal authority

The 'legal authority' element is based on the simple rule is that one may not sell something that does not belong to him (e.g., a person who contracts to sell you the Great Pyramid of Giza is not offering a valid contract). A complication of this rule, however, notes that it is possible to enter into a contract to sell property in future, where the 'seller' intends to acquire the property from its current owner and then sell it to the buyer. If that contract is not fulfilled, the would-be buyer's rights are only against this would-be seller – not against the actual owner of the property.

In ABS contracts, there are two legal authority questions:

Who is granting rights to genetic resources? and

37 Normally, if a government grants a right or permit, there is a specific time period during which officials and members of the public may challenge that grant. After that period has elapsed, the grant is 'final' and cannot be invalidated in that way (although they may be rescinded by other actions.).

38 For more information on contractual 'validity,' *see* Farnsworth, 2006, at 911 *et seq.*, and Neumayer, K. 1999.

On what is the basis did he obtain his right to grant them?

These ABS questions arise in a number of ways.[39] Some case studies have reported that users have executed ABS contracts where the providers did not have the formal right to grant access to genetic resources.[40] Each country can exercise its sovereign right under the Article 15 only by first determining which person or agency will be authorised to grant ABS rights.[41] If someone without this authority, even a government official, enters into an ABS contract, that contract is probably invalid.

In some cases, legal authority problems still arise when the legally authorized person or agency signs the ABS contract. This occurs when other persons, NGOs or communities challenge the government's decision. Recently, some local and traditional communities and others have filed challenges, claiming that the contract does not comply with basic principles of national law (e.g., constitutional law, human rights, indigenous rights, community rights, civil rights). They claim that the government exceeded its legal authority in granting the ABS contract (*e.g.*, through faulty public comment processes.)

Another type of legal authority problem relates to 'representative authority.' ABS decisions are sometimes legally justified by the consent/approval of a single person or a selected group (sometimes acting on behalf of the wider community). This approach presents a new legal authority question – *did the person(s) signing or granting the contract have authority to act on behalf of the other providers?* This question can only be answered by knowing both (i) who 'owns' the genetic resources at law and (ii) what requirements give a particular representative the right to act in a way that affects all owners?[42]

If the ABS contract is found to be legally invalid, the would-be user finds himself in a difficult position. He may have entered property, collected samples and/or taken other action in reliance on that invalid contract. If so, he might be legally liable to the true owner of the property for an amount that is difficult to determine fairly.[43]

Contract law requires the buyer to ensure that he is dealing with an authorized person (obtain certificates or other proof of legal authority, etc.) For conventional contracts, the law provides many ways of verifying ownership.[44] No such verification system is currently possible for genetic resources, leaving users with an unassessable risk that his ABS contract will be invalid.[45]

2.3.1.2 Legal capacity

'Legal capacity' or 'competence' is fairly straightforward. For example, a contract signed by a child or a person suffering from mental illness is normally not valid due to lack of competence. Other situations, such as fraud or deceit, have the effect of converting a competent party into an incapacitated one (he is effectively rendered incompetent to make a rational decision.) A contract cannot be valid if one party lacks legal capacity.

Capacity questions, however, do not eliminate the need for both parties to 'do their homework'. Contract law requires each party to make reasonable efforts to un-

39 The question of legal authority for 'genetic resources' is legally paradoxical, due to the possibility discussed above that there may be multiple unrelated owners of the same genetic material, but with only one being party to the ABS contract. The user's assumption that he may legally patent the genes obtained assumes that this one owner can give away rights in the genetic material on behalf of all other owners. Until resolved, this lack of a rational, consistent and equitable theory of the 'ownership' of genetic resources may create serious uncertainties that invalidate the contract or have other legal consequences.

40 *See,* e.g., Laird and Lisinge 1998, Verolme 1999.

41 CBD, Art. 15.1. Stating that, unless a country formally decides not to regulate access to genetic resources, access is a sovereign right of each country, granted only with that country's consent. CBD Art. 15.3.

42 Obviously, this question is most problematic where local communities or residents have collective rights in the genetic resources. In many cases, these communities are not incorporated in a way that gives one person administrative authority. Some community organizations are non-mandatory, so that one may live in the region but not be represented by the organization. If the organization represents most holders of the genetic resources, but not all, then it may not be legally authorized to enter into the ABS contract. In addition, many genetic resource transactions, although based in a single community, extend beyond that community, affecting people who are not governed by it.

43 The would-be buyer would be able to bring an additional claim against the would-be seller in such a case, but only if the would-be seller had sufficient assets to pay the claim.

44 For example, in nearly all countries the registration of rights in land and immovable property is proven by deed or other document from an official land registry. *See* Ruiz and Lapeña, 2007, at 4.1.2.

45 'Proof of legal authority' is a common requirement in commercial contracts. The breadth of national approaches to this type of proof is discussed at length in Sinnott, 1998. That proof must normally come from a legally competent external source, rather that a simple statement by the party himself

derstand and protect his own legal interests. This concept is called 'due diligence.' If a party does not exert due diligence in its own behalf, he cannot protect himself, in case the contract fails or the other party violates it.

Questions of legal competence can arise in ABS, where the providers are rural communities or individuals without access to legal or professional advice (on international commercial law, for example). Work is ongoing to develop international standards of good practice in sourcing materials from indigenous communities.[46] The standard developers are considering whether a user who seeks to obtain biological or genetic resources directly from a rural or indigenous community has a duty to that community. These users may attempt to meet their 'informed consent' duty by providing competent external advisors who can help the community to protect its rights and interests.

This issue has also (less specifically) been raised in the Bonn Guidelines, which note that 'the involvement of relevant stakeholders should be promoted by providing information, *especially regarding … legal advice*, in order for them to be able to participate effectively.'[47] Although the Guidelines do not clearly call on users to pay for these services, that is implied by the phrasing which indicates that the 'relevant stakeholders' will be 'provided' with this information, rather than having to obtain it themselves. In addition, the guidelines suggest that 'the stakeholders involved in access to genetic resources and benefit-sharing may wish to seek the support of a mediator or facilitator when negotiating mutually agreed terms.'[48]

In all cases, the goal is to ensure that the user who complies will be protected against claims that the providers did not have a full understanding of what they were signing and/or what their options were. This standard places a special burden on the user, however. He must locate and provide a neutral expert, knowledgeable in a combination of complex expertises (international commercial law, law of the provider country, contract negotiation, genetic resources law and, IPRs.) If that advisor is not competent to understand, explain and protect the providers' rights, the user will be responsible for any losses suffered due to the expert's lack of competence.

2.3.1.3 Fraud, misrepresentation and non-disclosure

Fraud and/or misrepresentation can invalidate a contract, where it causes the defrauded party to be legally incompetent – 'blinded' by the deceitful statements – at the time of signing. This deception may effect either

- intentional (one party lying to the other about the *res*, the rights that are granted, the meaning of various provisions in the contract, etc.); or

- unintentional (one party, without actually checking, making well intentioned but uninformed statements that are incorrect.)

In cases of deception, the legal result depends on whether the person intended to defraud or to give a false or unconfirmed impression. In some kinds of contracts, the duty goes still further. Each party may have a contractual obligation to provide 'full and fair disclosure' of relevant facts which are in his control or knowledge, and are necessary in order for the other party to make a rational decision about whether and how to enter into the contract.[49] Legally, it is sometimes difficult to determine which facts are 'relevant' and which information is not a 'fact'. It would be unfair, for example, to expect one party disclose its negotiating strategies (or highest prices, points on which they will 'be flexible', special inducements they

(a government official has no incentive to declare that his own decision has exceeded his statutory, administrative or legal authority.) Often, authority is proven by certificate from a higher level – e.g., a corporate resolution giving a particular person authority to enter into the contract commitments on behalf of the corporation. Persons acting on behalf of government usually provide formal confirmation from another (higher) level (an official letter from the Attorney General/Minister/President, a statute granting authority, etc.)

46 The BioTrade initiative is currently seeking to develop Guidelines on ethical sourcing practices for companies obtaining biological materials from developing countries (*See* draft concept note: *Practical Guidelines for Equitable Sharing of Benefits of Biological Resources in BioTrade Activities,* 3 March 2007.) That guideline specifically considers it to be the duty of a party seeking to purchase these materials to provide independent legal/technical advisors to the provider community.

47 Bonn Guidelines, Art. 19.a.

48 Bonn Guidelines, Art. 21.

49 Many basic facts known only to one party should, in fairness, be known by both sides before the negotiations are concluded. Such a duty might also arise, if you had known that hazardous materials have been spilled in the property being transferred, since it may not be possible to determine this with 'due diligence'. By contrast, the seller does not have a duty to disclose whether the plumbing works or whether the property is infested with pests, because expert inspection is available. *See,* generally, Marsh, 1994, pp. 112-139.

are prepared to offer, etc.) to the other. Similarly, the law does not require either party to tell the other all of its trade secrets. The laws stating which types of facts must be disclosed differ widely from country to country. If a party fails to disclose such a fact (whether intentionally or unintentionally), the contract may be invalidated.[50]

Concepts of honesty and disclosure are ingrained in ABS through PIC and MAT. The word 'informed' in the 'prior informed consent' is the key to the disclosure concept. Similarly, no agreement can be 'mutual' where one party has been deceived on a material fact. PIC and MAT recognize the informational needs of ABS parties, which are magnified by the fact that the subject matter is very technical across two basically unrelated fields – science/technology and law/policy.

ABS disclosure discussions sometimes assume that the user must tell the provider whatever he knows about (i) the genetic resource, (ii) the user's intended activities, and (iii) the value of the resources.[51] If they were subject to such a broadly phrased disclosure requirement, most companies would be unwilling to seek any more ABS contracts.

In commercial bioprospecting, companies may view many kinds of information to be 'trade secrets' – of great value only so long as they are kept secret from the company's competitors. Even basic information about the locality of sample collection and the species (or genus or family) being collected may convey hints that allow competitors to gain advantage.[52] If also required to identify the characteristics being studied and research processes undertaken, company secrets can easily be lost.

Some countries have adopted special legal procedures for protecting 'trade secrets' that are reported to the government. For example, some laws allow an applicant company whose application or report contains 'trade secrets' to specifically identify those secrets. If the company complies with certain procedures, the government promises to keep that information secret.[53]

In ABS, there is a basic overlap between 'trade secret' laws (which focus on protecting commercially valuable secrets) and public participation requirements (which focus on maximizing public access to information relevant to their rights in the genetic resources.) These potentially conflicting legal objectives create uncertainties and doubts about whether and how trade-secret protections, which are commercially necessary to many companies and researchers, can function in the ABS regime. While these protections are important, PIC and MAT are designed to provide another important element – open information. Its goals are (i) to ensure that providers have sufficient information to know what constitutes 'adequate value' in exchange for their genetic resources; (ii) to enable government officials in ABS transactions to meet their fiduciary duty to promote the best interests of the country and its citizens; and (iii) to provide information needed to determine what those best interests are. In addition, in most countries, the government is required to maintain a level of transparency that allows members of the civil society to serve as 'watchdogs' of the manner in which the government sells or transfers rights in the country's genetic resources (i.e., to confirm that the transaction is fair and that the price and terms are appropriate.) Moreover, in some countries, the 'provider' of genetic resources may be an individual or community. Such persons are not part of the government and would not be bound by statutory trade-secret protections, if they receive confidential information under PIC.

In sum, a country or other provider can determine what is 'fair value' in ABS, only by knowing in detail what the genetic resources are and why they are valuable.

50 Furmston, 2001, at 291-354 provides a discussion from one country whose practices have been widely studied and adopted (UK). For other jurisdictions' approaches, *see* Marsh, 1994, at pp. 112-139.

51 Extreme versions of this approach are found in some of the 'ABS certificate' proposals, which list a large number of facts to be disclosed in a certificate that will potentially have a wide circulation. *See,* e.g., the documents of the *CBD Meeting of the Group of Technical Experts on an Internationally Recognized Certificate of Origin/Source/Legal Provenance*, 25-27 Jan. 2007, especially: 'Consideration of an Internationally Recognized Certificate of Origin/Source/Legal Provenance' UNEP/CBD/GTE-ABS/1/2; and 'Compilation of Submissions Provided by Parties, Governments, Indigenous and Local Communities, International Organizations and Relevant Stakeholders Regarding an Internationally Recognized Certificate of Origin/Source/Legal Provenance' UNEP/CBD/GTE-ABS/1/3, and addenda, The BioTRADE Initiative's proposed standard for the sourcing of biological ingredients in commercial products is also relevant to this question. *See* footnote 46.

52 If one researcher expends significant funds to identify and locate a target species or genus, he may have a restricted budget for the next phases of his work. A competitor with more funds to spend and access to the first researcher's initial information, could have a head-start and quickly surpass the original researcher.

53 Under these laws, the information shall be excluded from public records or publicly accessible files, and the officials charged with responsibility for access to the information will be subject to both institutional and personal penalties for violating the secrecy.

There is no legal way to ensure that this information is kept confidential, particularly where it is shared through public participation. Although recipients of the information may promise to maintain confidentiality, such a promise may have limited value. Many persons will make a serious effort to keep the information secret, but that may not prevent all (intentional and unintentional) leaks, which eliminate the value of their efforts.[54] If one thousand people know a secret and 999 keep it confidential, the 'trade secret' will still be irretrievably lost when the remaining person exposes it. ABS contracts and relevant law must tread a fine line between maximizing disclosure (to protect providers) and minimizing exposure of trade secrets. Without this balance, users may refuse to participate in ABS contracts.

2.3.1.4 Statutory and constitutional provisions

Other types of laws may also affect the validity of a contract. For example, many countries impose special rules for contracts for the sale of land, for transfers of shares in companies, for time-payment transactions[55] or for other kinds of transactions.[56] Many countries specially restrict all contracts by which a private person or entity seeks to obtain ownership or other exclusive rights in State property (i.e., 'national patrimony', 'crown lands', sovereign lands, etc.)[57]

If ABS contracts are governed by any of these laws[58], then they must meet their special requirements. Thus, each country must determine what kind of property genetic resources are, whether they can be governed by existing contract and property law, or whether new or revised contract and property laws are needed. For ABS, these provisions create two types of problems: of awareness, and of compliance. Awareness problems arise because many potential users assume that the only law that they must comply with is the 'national ABS law' (if any.)[59] In many countries, neither users nor providers understand or seek help with the large body of national law (contract law, property law, commercial law, consumer protection, etc) which legally applies to all contracts. For ABS to become a commercially functional system, ABS contracts must be formally integrated with these non-ABS provisions in the negotiations.[60]

It is important to remember that these laws serve vital social, commercial and governmental issues and purposes. It is tempting to simply state, within ABS law or the contract, that various laws and restrictions do not apply to ABS; however, in order to do that, it may be necessary for ABS law to adopt provisions that address those other issues and purposes.

Presently, existing national ABS-laws are relatively simple and straightforward. They have not yet integrated special provisions to combat sophisticated transactional ploys for evading commercial restrictions. To maximize effective functioning and avoid abuses, it is usually necessary for the country's general commercial laws to apply to ABS Contracts, and for parties to obtain competent legal advice from a commercial lawyer knowledgeable about the source country's commercial laws.

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54 This type of promise would require each secret-holder to accept liability for the harms caused by leaking the secret. Even then, the entity requiring trade secret protection would bear the burden of proving (i) who leaked the secret; and (ii) that the 'leaker' was bound by that promise. And he can only be compensated if the promisor has sufficient assets. Individual providers and rural communities rarely have sufficient assets to compensate for commercial injuries such as the loss of trade secrets or release of preliminary research data.

55 Many countries place limits on the rate of interest that may be charged. These laws look beyond the contract, since a contract may have the same effect as extreme interest rates, even if it does not specifically call the additional charges 'interest.'

56 A number of countries, for example, forbid contracts of extremely long duration (above 5 years, for example), unless they comply with certain special requirements. (UNITED STATES: Uniform Commercial Code § 2-201.) This general rule dates back to the 1600s, in Britain, where it was embodied in the 'Statute of Frauds and Perjuries' (UNITED KINGDOM: Charles II, 1677: An Act for prevention of Frauds and Perjuryes.', Statutes of the Realm: volume 5: 1628-80 (1819), pp. 839-42.) The concept is also embodied in law of many civil law countries.

57 Laws controlling the sale of government property to individuals are designed to prevent abuses, including by ensuring that the government official who approves the transaction is not (legally or financially) related to the person or entity purchasing the property. Over decades of applying these controls, many kinds of disguised relationship have been found. As a consequence, the law now focuses on many disguised abuses.

58 As discussed in chapter 1, the CBD Secretariat has recently undertaken a preliminary study of the 'status of genetic resources' in countries by considering those countries' land-ownership laws. It has not yet done the next steps in this process, examining national laws relating to other types of property.

59 As noted in 1.2.5, few countries have adopted such laws.

60 Compliance with these laws is not as easy as it sounds. Most have been developed over decades or centuries to prevent abuse of commercial processes. For instance, laws against 'usury' (illegally high rates of interest) have evolved and become more complex, in order to address many different contractual ploys through which some have tried to take advantage of weaker parties by creating contracts that have the effect of usury, without specifically imposing a usurious interest rate. For a general discussion *see* Beatson. and Schrage, 2003,Chapter 8; Marsh, 1994, at pages 290 – 309.

2.3.2 Reliance: Validating an invalid contract

There are some instances in which fairness may require that an invalid contract should be maintained and enforced. This may happen if three factors are present: (i) one party to the contract 'relied' on it (taking action in expectation that the contract will be fulfilled); (ii) that party was not the cause of the invalidity of the contract; and (iii) it is necessary to maintain the contract, in order to protect that party against an unjust result. For example, if a provider allows bioprospecting and testing to occur under an ABS contract, and then discovers that the contract is legally invalid, it would be unfair to terminate or unwind the contract, because the return of the genetic material and/or information obtained by the user will not prevent the user from utilizing the information of its research, products or other benefits. It is fairer if the court allows the contract to stand, and requires the user to share benefits, despite the technical invalidity.[61] If the provider would prefer to invalidate the contract, however, the court may do so. The concept of reliance is a basic element of commercial fairness.[62] As such, it will certainly be relevant to ABS contracts. [63]

2.3.3 'Contractual formalities' and the importance of a written contract

The phrase 'contractual formalities' has sometimes been used disparagingly, as if these formalities are 'boilerplate' (something simply copied into all contracts with no concern for its meaning), or 'small print' (something very complex and difficult to read, which is inserted by unscrupulous parties to change the meaning of the contract). In fact, however, the formalities of contracts are neither of these. They allow certainty as to when the contract becomes final, 'facilitate proof that a final binding contract exists and confirm the seriousness of the parties' intentions.[64]

Many different formalities exist in different countries that can be used to for this purpose. In ABS contracts, parties sometimes include rural peoples, indigenous groups, and persons and institutions from least-developed countries; hence, many authors suggest that the contract should in each case take the form most common for these parties, even if that form is non-written and formalised by 'kava-drinking rituals' or other ephemeral actions.[65] While this idea holds allure for many developed-country parties and their lawyers, the best interests of the parties desiring to create a functional contract are served where there is a written binding instrument that can be easily enforced in the courts of the user country. Without such an instrument, the legal certainty of the ABS contract diminishes significantly.

This same need – to be clear and enforceable – underlies all aspects of the contract, from the first written provisions to signature. Its goal is to maximize and protect the Parties' rights, not to make sure everyone is comfortable. In the words of commercial law,

> *Legal advice and involvement in negotiations cannot provide complete insurance against a legal challenge, however, our goal is to maximize shared understanding, and minimize the number of future disagreements that cannot be easily resolved (by referring to the text of the agreement).*[66]

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61 *See* Beatson, Schrage, 2003; Cohen; McKendrick, eds, 2005, at 81-82; Marsh, 1998 at 101-108; Klimas 2006 at 73-126.

62 It recognises that equity between contracting parties may be different from the terms of the contract.

63 For more discussion of reliance, s*ee,* e.g.*,* Farnsworth at 907. ('With the development of competitive markets and the specialization of labour, it became essential to provide a general basis for the enforcement of promises, even before any performance by either party. Such transactions are a far cry from the simple credit transactions such as the loan of money or sale of goods.')

64 For 15 centuries, the law has stated that a contract will exist where it meets certain strict forms of words and procedures of signing. *See* Zimmermann, 1996, which includes a discussion of the contractual formalities in the Code of Justinian (6th Century) and how they have come down to modern contract law.

65 *See,* e.g.*,* Gollin, 2002, at 312; Laird, 1999, and Chon and Ghosh, 2000.

66 Personal communication, John Pierce, *circa* 1982. Probably available in publications. Based on notes of personal consultations with him, beginning in 1981.

This goal is met most effectively when there is a single legal document which all parties agree reflects the entire substance of their agreement, and when it is clear that the instrument has been finally agreed and completed. Because ABS contracts are multinational in potential scope – it will be even more important to be certain that the document can valid in both the provider's and user's countries, as well as any country into which the genetic resources will be transferred or utilized.

The basic elements of any contract can be recognized, proven and applied in various countries, so long as they are written in recognizable contract form and have been adopted with formalities recognized under the 'governing law' of the contract.[67] These are designed to make future legal actions and activities relating to the contract easier. By contrast, reliance on a traditional-formalities-style contract may make it much more difficult and costly to prove the existence and validity of the contract (the first step in judicial and non-judicial processes to enforce contracts.)[68]

2.3.4 Other concepts: 'Governing law,' customary law, traditional law and private international law

In any contract involving persons, entities or property from more than one country, it is usual to choose one country's law as the 'governing law' of the contract. Governing law provisions are sometimes misunderstood. The selection of governing law is sometimes complicated by uncertainty about other principles that might be applied in interpreting the contract. These principles include 'choice of law' (sometimes known as 'private international law'), 'customs of the industry' (provisions that are common in certain types of contracts) and 'traditional and customary law.' All of these legal issues may apply, where useful to enable legal relationships to function more fairly. They can also cause confusion, however, particularly in international contracts.

2.3.4.1 'Governing law'

The concept of 'governing law' is integrally linked to the question of contract validity. If the contract states a particular country's law to be 'governing', that statement will control;[69] however, if not, there are rules for determining which country's law shall be used for this purpose.[70] Governing law's primary task is determining whether a valid contract exists. If the contract is governed by the law of France, for example, then its validity will be determined under French law no matter where the contract is carried out or interpreted. This is the main purposes of 'governing law' provisions – to determine whether the contract is valid.

'Governing law' provisions may not affect the interpretation of the contract and other legal questions. The determination of which country's law applies to the substance of the contract or to claims of violation is usually decided under a very complex legal concept called 'choice of law.' Some issues may be decided under a contract's 'governing law,' while others *within the same contract* are decided under the law of another country.

In ABS, the selection of governing law may be difficult, because so few countries have legal provisions or

67 Internationally agreed contractual systems have developed over 1-2 centuries. Countries have special processes for verifying contracts, by a certificate or affidavit, confirming the identity of the signatories, and/or the contract's validity. In some countries, this process is relatively simple and quick; in others, very complex and time consuming. An excellent summary of processes and issues involved in documenting multi-country contracts is found in McClean, 2002, at Part II.

68 *See*, McClean, 2002, at chapter 2; Farnsworth, 2006, at 920-922. For a contrary perspective on the use of traditional formalities, *see* Laird, 1999, noting that written documents 'go against a more friendly atmosphere of research collaboration;…require too much time and investment for short-term research projects;… can be understood by communities only with legal or other expert assistance; [or] can be made with the wrong party or parties within a community.'

69 A key drafting question is "What country should be the 'governing law?' " In most commercial contracts, one would base this choice on the countries' rules of 'contract validity', as well as practical questions (e.g., How easy will it be to get a certificate or other proof of the validity of the contract, if needed in future?).

70 If a contract does not state which is the 'governing law,' a court will normally consider to be the law of the country in which the contract was signed to be the governing law. This can be problematic where the parties are from (and signing in) different countries.

precedents addressing genetic-resource concepts, and have not made decisions to aid in integrating ABS with national contract law.[71]

2.3.4.2 'Industry-wide custom and practice'

Contract law's primary *raison d'etre* is to help contracts function as effective tools of commercial and civil interaction. This means that most contract laws are legal 'safety nets' rather than requirements. If a contract forgets to mention a key element, contract law may provide a *de facto* provision for the contract, which can be used as a way to make the contract valid, despite the omission.

For some kinds of contracts, a second type of safety net may also be available – legal custom. The standards of a particular industry or a particular type of contract can become so well accepted that courts apply them to every contract within that industry, unless that contract specifically says otherwise.[72]

At present, few 'common practices' have developed in ABS, because ABS has only existed for about 15 years,[73] and is not implemented in national law of most countries. As discussed in 1.2, fewer than 30 countries have formal law that even mentions ABS, and at present *no country* has fully met its legal obligations under Article 15. Consequently, there are few (if any) accepted industry practices in ABS. The WIPO database used in this book, has obtained fewer than 50 documents worldwide, none of which have yet been judicially tested. There is still no basis for knowing that any contract provision is sufficiently accepted to justify international reliance.

2.3.4.3 Indigenous and traditional law

When one is engaged in a transaction with a community that is very localized and functioning on the basis of traditional/indigenous laws and norms, it is usually necessary either (i) to operate under that customary law, or (ii) to take special measures to ensure that all parties understand and agree to the use of other principles of law. This presents a practical challenge in ABS, both because of the special needs of these communities in negotiations and because of the need to (i) ensure the validity of ABS contracts no matter where they are signed, and (ii) enable commercial/judicial interpretation of those contracts, in any user country or in any court governing users.[74]

2.4 Enforceability: Creating a 'binding' contract

After confirming that a contract is 'legally valid' it is necessary to determine that it is also 'legally binding'.[75] Any valid contract is a kind of promise.[76] However, not all promises are legally binding. A promise is legally binding only if it meets the criteria of enforceability. Although these criteria differ from country to country in terms of particular details, the basic concept is shared by all contract law frameworks.

The following sections briefly summarize the ABS aspects of the four critical aspects of enforceability: (i) overarching fairness principles, (ii) characteristics that must be shown in order to have a legally binding contract, (iii) specific components that a contract must contain and (iv) other factors affecting enforceability. The discussions below are designed to complement Chapter 3, which provides numerous examples of provisions from

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71 *See* § 2.1.2.1, above.

72 For example, in Japan, the law states that 'Where custom differs from any provisions of laws or ordinances which are not concerned with public policy, it shall be deemed that the parties intended to conform to such custom, and that custom shall prevail.' JAPAN: Civil Code, Art. 92. (Translation in Visser 't Hooft, 2002.) *See Asahi Shoseki Hanbai K.K. v. Suzuki Takashi and Saijō Kanji*, 1045 *Hanrei Jihō* 105 (Tokyo District Court, 30 September 1982.) (invalidating a 20-year contract for textbook distribution because customarily these types of contracts are not of such long duration.) Per Visser 't Hooft, 2002 'In certain situations, custom can be an important source of law, having an important function in filling the gaps between formal law and social reality. A court might hold that widely accepted commercial practices are part of a contract, even if not included in writing.' (at 24.)

73 Laws and legal principles normally develop at a glacial pace. By comparison to contract/property law, which evolved over many centuries, ABS is a quite new phenomenon.

74 *See* footnote 66.

75 The legal meaning of the term 'binding' is not always understood. In the normal course, this term is not relevant to conventions and legislation, which are *always* legally 'binding' in the sense that all persons are required to comply with them. The questions raised in ABS, regarding whether the law is 'binding' focus on the fact that ABS contracts cannot be enforced as a practical matter. In normal legal usage, 'binding' refers to enforceability of contract promises. To determine whether a contract is 'binding', one must ask whether the law can and will enforce that contract.

76 'No legal system has ever been reckless enough to make all promises enforceable. In theory, one can approach the question of enforceability from two

existing ABS contracts (some of the contracts presented in chapter 3 are clearly legally valid and binding/enforceable, some are legally 'valid' as contracts, but are not practically enforceable). Finally, there are some which are neither contractually valid nor legally binding.

2.4.1 Principles of fairness, good faith and trust

In nearly every country, national law and judicial principles state that, no matter how perfectly the parties have complied with contract law, their contract will not be enforceable if it is not fair. The standards for determining fairness are often discussed under the headings 'good faith' and 'trust.'[77]

Where it would be unfair or in bad faith to apply the normal rules and processes to a particular contract, the court may find it necessary to use other means to protect commercial fairness, i.e., to enforce a contract that would otherwise be invalid, or to render one which is valid to be void.[78] Increasingly, fairness among the parties, rather than strict legal factors, is relevant to determine whether a contract is binding.

While this added measure of protection may be a comfort to inexperienced negotiators, it should not be relied on, because most courts will normally expect each party to take reasonable steps to protect his own interests.[79] If the court finds that one party did not take sufficient care and did not make an effort to ensure that their contract is fair and properly defends their contractual or commercial rights, then it may refuse to apply special protections of this type. Thus, parties negotiating a contract still must know exactly what the contract requires (legal certainty), and should be motivated to ensure that it meets conventional contract law standards.

2.4.2 Characteristics of a binding contract

To be legally binding, a contract must meet four criteria in a manner that can be objectively observed by a court or by some other external person (e.g., arbitrator, mediator, government official, or employee of one of the parties):

(i) both parties must clearly *intend to be bound* by the contract,

(ii) the instrument must be *definite*

(iii) its provisions must be *unambiguous*, and

(iv) it must be *un-coerced*.[80]

As examined in the following sections, each of these characteristics poses some special challenge in ABS contracts.

2.4.2.1 Mutual intention to be bound

The concept of 'mutual intention to be bound' is simple. A contract or any of its specific provisions can be binding only if both parties intend this result.

In ABS, mutual intention issues usually arise where the user or collector has received permission (a contract, license or other approval) to collect particular specimens from the source country or other provider, but the provider states that this permission did not include permis-

opposite extremes – by assuming that promises are generally enforceable, subject to certain exceptions, or by assuming that promises are generally unenforceable, and listing the exceptions to that general rule. Both civil law and common law have made this latter assumption.' Farnsworth, 2006 at 907.

77 Marsh, 1994, at chapter 1; Beatson, J and E Schrage, 2003, Chapter 9.

78 *See generally* Marsh, 1994, pp. 290-309.

79 Reimann, M and R Zimmermann, 2006, at Chapter 29.III.

80 The UNIDROIT Principles of International Commercial Contracts, 2004, express these principles. The formal application of these principles is limited to 'contracts for the sale of goods.' It is not clear that they are applicable to an ABS contracts, which may be a 'sale of goods' a transfer of intangible property, a grant of a legal right, or some other type of transaction (*see* footnote 138, below). *See* also Marsh, 1994, pp.290-309.

sion to utilize the specimen's genetic resources. Under this theory, permission to collect and remove specimens is perceived to be separate from permission to commercially utilize its genetic resources: the collector and/or his transferee need some further permission before engaging in commercial use of genetic resources.[81]

For example, in the so-called 'Kenya extremophiles' case,[82] the original specimens were collected by an academic researcher, who claims to have obtained permission to collect them. The collector subsequently transferred collected material and research results to a commercial user. Objectors claimed that Kenya never gave permission for the commercial use of the genetic resources of the samples taken.

If the objectors claim (that the original permission did not include commercial use of the genetic resources of the *res*) should be held factually and legally correct, then the original permission would be invalid due to lack of mutuality between the parties. To resolve this, the original contract must normally be unwound, however, in ABS, it may be impossible to fully unwind a contract after the resources have been collected and analysed.[83] Under contract law, if an unenforceable contract cannot be unwound, the court will normally create a second contract to ensure that both sides are fairly compensated.

2.4.2.2 'Sufficiently definite'

A second element of enforceability is *definiteness.* The contract's provisions can only be enforced if it is 'sufficiently definite' in the eyes of an external person (including a judge or arbitrator) regarding what each party must do, give or receive and when (and how).[84]

A contract that is too vague is not legally enforceable, for an obvious reason. The parties and their employees do not know exactly what is required of them and what they may expect from other parties during the time that the contract is operational. The details must be clear enough that the parties can apply them in the event that unexpected factors or conditions arise. Judges and arbitrators too must have clear evidence of the specific elements of the contract, in order to know what to do if the parties cannot resolve some dispute or uncertainty and ask the court to help.

'Sufficiently definite', however, is a matter of degree. Contracts often contain conditional terms and are still binding. For example, a purchase contract may cover 'all apples harvested on Property X between day Y and day Z.' Such a contract will be sufficiently definite even if the full amount of apples is unknown unless it is not possible for one party to know or verify where or when the apples were harvested.

In conventional contracts, questions of definiteness are most often discussed in relations to the sale of goods. In that type of contract, it is essential to be very clear about the precise goods transferred, the price to be paid, the conditions to be satisfied, and the schedule of performances.[85] In other types of contract (*e.g.*, for employment or for the purchase/sale/lease of land and buildings) different elements are applied to measure whether the contract is sufficiently definite.

Given the various uncertainties in ABS, the challenge of contractual definiteness is rather difficult to address. To date, no court or national law has determined that ABS will be governed by the rules of a particular type of existing contract, so it is not possible to use existing law as a clear guide to the measures of definiteness. Similarly, as noted in part 2.1.2 of this chapter, the international regime negotiations have not yet specified the

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81 This leads inevitably to the connected question – *Which activities constitute 'utilization of genetic resources' (requiring ABS permission), and which are not?* This issue is discussed in Tvedt and Young, 2007.

82 Discussed in detail in Mgbeoji, 2006b.

83 For Kenya, it would not be possible to 'un-ring the bell' (once the commercial user has identified the species' genetic and biochemical information and related knowledge, those gains cannot be rescinded.) Appropriate remedies would be sought through an 'implied contract' which assumes that the parties have agreed to be bound to payment and other specific benefit-sharing obligations. The specific compensation that is fair in this instance would be selected by the court.

84 For example, an agreement to sell one apple to buyer in exchange for immediate payment of five cents, is very definite. An element of potential uncertainty is added, however, if the seller agrees to a discounted price, in exchange for the buyer's promise to buy tomorrow. What if tomorrow's apples taste bad or are rotten? What if funds are in the bank, and tomorrow is a bank holiday? Other such questions might include the situation in which a seller may intend to sell the apple 'as is,' while the buyer intended to buy only if it were edible. If the parties did not discuss this in advance, then the law may have to decide whether buyer's obligation was sufficiently mutual and definite. Other questions focus on whether the contract included a specific purpose (i.e., to make apple pies), and which party will bear the risk that the flavor of the apples will prevent this purpose?

85 Folsom, 2004, at 70-125.

particular nature of 'genetic resources,' 'benefit sharing' and other key contractual elements.

For these reasons, this book will not attempt to identify specific definiteness criteria, but offers the following 'educated guesses.' Specifically, any ABS contract should include all three of the following:[86]

(i) Either

   a. a precise description of the contract subject matter, or
   b. the mechanism for later specifying the precise subject matter covered by the ABS contract (the particular species whose genetic resources are collected, are used in analytical processes, are used in the development of commercial products, etc);

(ii) Either

   a. a precise price and payment terms, or
   b. a specific mechanism for determining what price will be paid and when; and

(iii) A clear statement of the scope of the interest granted to the user (e.g., the extent of the user's rights vis-à-vis specimens or genetic resources, including rights to file IPRs, other intangible rights to genetic information[87] and/or particular rights in any tangible property that is transferred or collected in connection with this contract).[88]

For those negotiating ABS contracts, it is a challenge to create a definite contract when using indefinite terms. For example, some try to minimise ambiguity by avoiding the use of the term 'genetic resources,' writing a contract describing the collection of samples. In this case, the contract would be 'sufficiently definite' regarding the *collection* of samples of one or more species,[89] but not regarding the *utilization of its genetic resources.*[90]

Similarly definiteness about the 'price' and 'interest granted' in bioprospecting situations may be a problem. Most basic elements for determining the value and potential use of genetic resources and the type of benefits that might be shared may be completely unknown at the time of collection.

2.4.2.3 Unambiguous

Even where it is sufficiently definite, a contract may be unenforceable, if the parties have different understandings about the terms and conditions of the contract.[91] Clearly, the ambiguities in the international ABS regime (well discussed in other parts of this book) suggest that this ambiguity may be the greatest challenge in developing ABS contracts.[92]

Where the parties are in an ambiguous situation, the challenge of creating an unambiguous contract must be met by private agreement of the parties. In other words, the contract must clearly demonstrate in very definite language

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86 Based in part on the CSIG, Article 14; discussed in Folsom, 2004, at page 40.

87 In particular, where it grants an intangible right, the contract must clearly describe that right. Contracts relating to patents, for example, must specify the right granted very precisely. Such a contract may grant anything from a right to use the innovation once, to a license for large scale commercial use or to the transfer of the entire patent (all rights to control other uses of the innovation).

88 The range of rights in immovable property is extremely broad, with specific rules and rights for every type. A right in land may be *inter alia* outright ownership, lease, a right to use the property, the right (limited or unlimited) to collect specimens from the land or a right to cross the land at any time.

89 Where a contract states that the user will later identify the samples collected, it is sufficiently definite if it provides a clear mechanisms for that identification and for determining what price will be paid.

90 *See* the Kenya Extremophiles case, discussed in 2.4.1.1 above. The right to collect specimens of biological material is normally not restricted by law, unless the species involved is legally protected, or when the specimens were collected on land that one may not legally enter. In other instances, these collection activities are only subject to legal control is when they are done for purposes of utilizing genetic resources. This issue is discussed throughout Tvedt and Young, 2007.

91 This difference in understanding is only relevant where the contract is 'ambiguous' from the perspective of an outsider reading the contract document. If the contract appears to be unambiguous on paper, then the fact that one party states that he had a different view is not a basis for declaring it unenforceable.

In law schools, a classic example of ambiguity is this: Consider a sales contract that does not specify which party will pay shipping costs, in a country which has no law stating who must pay those costs where the contract is silent. The seller reasonably believes that the buyer will pay all shipping costs, and the buyer believes that all such costs will be borne by the seller. If other factors are equal, the court or arbitrator may find the parties never agreed on price and refuse to enforce the contract.

(i) what rights and material are to be transferred under the contract;

(ii) what benefit-shares are given in return; and

(iii) that the contract grants rights in the specific genetic resources (approval from the person, agency or government that has the right to make such a grant).

2.4.2.4 Un-coerced

As the fourth essential characteristic, a binding contract must be 'uncoerced' – that is, the parties must feel that they 'have a choice' either to negotiate terms that they are comfortable with or to refuse to enter into the contracts. This issue is different from 'mutual intention to be bound,' since a party may intend to enter a contract, even when he has been coerced and feel that he has no choice but to approve the contract. Coercion can happen in many ways. In rare cases, one party may threaten the other with harm or loss if he does not enter into the contract. In others, one party may fear that if he does not enter into the contract 'as is', he will never be able to sell his property to anyone else.

For ABS purposes, a very mild form of coercion, sometimes called a 'contract of adhesion' or a 'take-it-or-leave-it' contract may sometimes happen. This situation arises when one party gives the other a 'form' or 'standard' contract and states or implies that no changes to the contract will be allowed – i.e., that the other party must either sign the contract as-is or walk away entirely.[93] The second party may be told that he has no choice, or may be led to believe that the terms in the adhesion contract are fixed within the industry, so that no better deal is possible. In many countries, conventional contract law imposes very strict controls on contracts of adhesion. In some cases, these documents may be unenforceable, particularly where the party who uses the form is stronger than the other in the commercial sense (having more financial resources and/or access to legal advice).[94]

The control on contracts of adhesion does not eliminate the use of forms, but rather *enables* them. Forms are not considered 'contracts of adhesion' if they meet several criteria, regarding:

- their content (that they are generally fair and balanced);
- the manner in which they were created (that they take the needs and interests of both parties into account); and
- the manner in which they are used (that only appropriate parties may use them, and only after they have a fair understanding of their options).

Both national law and general principles of law relating to contracts of adhesion must be applied in evaluating the use of form contracts.[95] The nature of the parties is one of the most important factors in determining whether a form or other contract is coercive. Where one of the parties is less sophisticated or has less knowledge regarding commercial law or contracts, then there is a greater possibility that the use of a form contract may give that party a feeling that they have no choice or can make no changes. Typically, laws against contracts of adhesion are strongest where a large commercial entity or organization negotiates with a rural person or community.[96]

In ABS contract negotiations, there are two situations that raise these concerns. First, in some countries, local and indigenous communities and private individuals may be direct 'providers' of genetic resources, and are

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92 The ABS ambiguities currently being discussed may be only the 'tip of the iceberg.' Even after 'key ABS terms and concepts' are agreed by the ABS regime negotiators, a second tier of 'sleeping ambiguities' may become obvious through experience. For example, after the term 'genetic resources' is clearly defined, contract parties may still have to define what constitute 'the results of research using' genetic resources – i.e., what information must be shared under the 'research clause' of article 15.7, and when this sharing must occur. Discussed in Tvedt and Young, 2007, at 4.3.2.

93 Contracts of adhesion are often pre-printed forms. This format gives the party the feeling that he may not change the terms and must agree to the entire contract.

94 Similarly, some contracts may be considered unconscionable where a commercially stronger party uses this strength to obtain an unfair advantage over the weaker party (for example, the price received by the weaker party may be grossly undervalued.) In a further recognition of this concept, many countries have adopted consumer protection laws and other statutes to protect parties in other unequal negotiation situations. *See,* e.g., Lord, 2007 at chap.18 'Unconscionable Agreements.'

95 More details about the use of form contracts are discussed below at 3.1.

96 Furmston, 1993, at pp. 399-444.

encouraged to negotiate ABS contracts directly.[97] Adhesive provisions increase the chance that contracts will be negotiated by parties who are inexperienced in contract law and legally unsophisticated. This suggests that those negotiations may be subject to special rules and scrutiny, to ensure that they are not legally considered to be coercive.

Second, due to the multiplicity of possible 'owners' of the same genetic resource (*see* § 1.2, above), many providers have a strong 'take-it-or-leave-it' feeling. The provider may feel an unstated threat that the user will turn to another provider, unless the first provider accepts the terms offered with no complaint.

There are a number of ways for contract parties to ensure that their contract is not coercive. One option calls on the commercially sophisticated seller to provide separate legal and technical advisors who can help the provider understand and protect its rights.[98]

A second means is for the legal system to specifically adopt particular forms and models and to clarify which parts of those documents can be negotiated or changed. A number of countries have specifically adopted forms, which are still new enough that they have not yet been tested or proven in practice.

One of the most interesting examples of the adoption of a standard form genetic-resource contract is the Standard Material Transfer Agreement (SMTA) under the ITPGRFA. As further discussed in 1.4.4, there are two aspects of the SMTA negotiations which serve to ensure that the SMTA cannot be considered coercive. First, the SMTA was negotiated in a very public process by a broad base of negotiators. The primary objective of this process was to ensure that the SMTA would ultimately be fair to all users, collectors (middlemen) and providers of genetic material. Second, the SMTA is not available to just anyone – only to agricultural collections and developers of agricultural plant varieties.[99]

2.4.3 Necessary components of a binding contract and of an ABS contract

Under the standard analysis, the necessary elements of a binding contract are very simple – offer and acceptance. A contract is formed by an *offer* from one person (or entity), which is *accepted* by another person or entity.[100] Unfortunately, even this relatively straightforward aspect of contracts is not as simple as first appears. The following briefly summarizes the requirements underlying the primary 'elements' of a contract, focusing on special issues most relevant to ABS contracts.

2.4.3.1 'Mutual assent' and 'prior informed consent'

The most basic requirement of a contract is the need for mutual promises ('offer and acceptance' or 'mutual assent') that properly document the fact that both parties have agreed and consented to the same 'terms of the contract.'[101] In order to demonstrate mutual assent, the contract must show that the parties both agreed to the document and had the same understanding of what it means.

By law, however, the concept of mutual assent contains an element of information. A party 'acceptance' of an offered contract can only be valid, if he is 'legally competent,' as described in 2.3.1. In particular, where the offering party has sole access to critical information that would be necessary to make a responsible choice, then the law may hold that the offering party must share this

97 *See*, e.g., ABS law of Australia, Costa Rica, and Brazil. All of which are developing governmentally mandated form contracts to maximize fairness in the negotiations.

98 The Biotrade initiative, referenced in footnote 32, is considering recommending this option.

99 ITPGRFA § 12.3(a).

100 In a few countries, two additional elements – known as 'consideration' and 'mutuality' – are required. A summary of some of these issues is contained in the UNCITRAL Convention on Contracts for the International Sale of Goods, at Articles 14-23. As noted in footnote 78, above, the CISG is primarily intended for commercial sale of 'goods' and may have limited application to ABS.

101 In contract cases, the question of mutual assent usually involves deciding whether the 'offer' was intended as an offer or just as an opening of discussion, and whether an 'acceptance' was truly acceptance or a 'counter-offer' restarting the negotiations. The most common issues of mutual assent are described in Klimas, 2006, at 19-96.

information with accepting party. This concept is known as 'informed acceptance,'[102] and it is normally required by law, in order for the contract to be legally valid.

In ABS, some commentators compare the contractual concept of 'informed acceptance' to the CBD concept of 'prior informed consent' or PIC – a term that is used, but not explained, in the Convention:

> *Access to genetic resources shall be subject to* prior informed consent *of the Contracting Party providing such resources, unless otherwise determined by that Party.*[103]

Negotiators sometimes assume that PIC and informed mutual assent are similar; however, this similarity does not run deep, and the assumption may lead to confusion. While commercial entities may view PIC as a contractual concept (i.e., a requirement that the provider must give 'informed acceptance' to any ABS contract), the existing national laws implementing PIC are not contractual in nature.[104] In general, national ABS laws calling for PIC serve as tools of a very different process, known as 'public participation in decision-making.' These laws sometimes create a new hurdle in the ABS process – requiring a public meeting or other process, before the government may give final approval to the ABS contract (which will also have to meet contractual requirements of informed acceptance.) For commercial users, this confuses what they perceive as a standard commercial negotiation.

In other countries' laws, PIC and formal acceptance of the ABS contract are separate processes – one governing the contractual consent (negotiation of the ABS contract) and the other focused on public involvement and awareness.[105]

In other countries, however, the two are blended, with the public participating directly in negotiating and approving the ABS contract. This approach may lead to practical problems. For example, it may be difficult to know what the contract requires, when the law requires compliance with the desires of a public meeting.[106] Obviously, when a large group is drafting an instrument, their multiple perspectives may not be drafted with 'contractual specificity,' leading to uncertainties regarding exactly what the contract means.[107] Less obviously, the public's role in the drafting process may create confusion regarding the role of the 'provider' in overseeing or enforcing the contract. In effect, every public participant may feel that he has an ongoing right to participate in enforcement decisions, or to take legal action against the user (individually or through his community or an NGO).

Finally, sometimes parts of the ABS contract may be copied into another document, such as a (separate) government-issued license or permit for genetic resource collection and utilization and/or language from the ABS license may be inserted into that contract.[108] These two documents have separate legal roles, and may be separately applied and interpreted. This double interpretation of the same language may further obscure the precise responsibilities of the user and rights of the provider.

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102 At this point, it will be clear to the reader that the various concepts described in this chapter are overlapping, as the 'informed' element of 'informed acceptance' is basically identical to 'legal competence' as described in 2.3.1.2 and 2.3.1.3.

103 CBD, Article 15.5. In the CBD, the term *Contracting Party* means a country that has become a party to the CBD (*see* CBD, Preamble, first line, *et passim*.) It does not refer to the individual parties to an ABS contract.

104 The operation of national PIC laws in the Philippines provides a useful example of how PIC is different from normal contract view of 'informed acceptance' and how it may inhibit users from seeking ABS contracts. Benevidez, 2004.

105 This is similar to EIA, which may often involve two separate governmental processes at the same time in different agencies: (i) the decision to approve development or commercial action and (ii) the EIA process. In many countries, although public participants do not make the contract/licensing decision, they contribute to the EIA process, giving comments which must be addressed by both deciding bodies. *See,* Morris, P and R Therivel, 2001.

106 In the Philippines, for example, each individual community holds its own public participation process through which the entire community participates in the drafting of MAT between the user and that community. This can be a challenge where a bio-prospecting project canvases a large region, as the user must comply with many very different contracts and identify imprecise community boundaries, so that each specimen's precise collection point is linked to particular MAT. Benevidez, P., 2004.

107 One example of this phenomenon is, of course, CBD Article 15, which was drafted by a large 'committee' of delegations, resulting in a document whose precise legal meaning is still uncertain and being hotly debated 17 years later.

108 In many instances, the law requires that the ABS relationship is defined in more than one different instrument, whether all are negotiated at the same time, or at different stages of the contract.

2.4.3.2 'Agreed terms and conditions'/'mutually agreed Terms'

Another element of mutual assent requires specific agreement and shared understanding of the specific terms and conditions of the contract. This concept of 'agreed terms and conditions' of the contract may be essentially similar to the CBD phrase – 'mutually agreed terms' (MAT).[109]

Overall, it is useful to more deeply consider the term 'mutual.' Contract law uses the word frequently ('mutual intent to be bound,' 'mutual assent' and, in some countries, a third concept called 'mutuality of obligation' or 'consideration.')[110] ABS sounds very similar when it refers to 'mutually agreed terms.' These two discussions sound very similar, but in practice serve very different roles.

In ABS, Article 15 mentions MAT in two separate provisions. Article 15.4 requires MAT wherever a user obtains access to genetic resources. Article 15.7 separately requires MAT for benefit-sharing. Many possible interpretations have been suggested to explain this double reference. For some, it suggests the controversial view that *access* is not commercially linked to *benefit-sharing*.[111] This view would find that 'access contracts' and 'benefit-sharing contracts' are separate and unrelated. A user who acquired genetic resources without permission (no access contract) may still be required to obtain and comply with MAT for benefit-sharing. In another possibility, an access contract may specifically state that no ongoing benefit-sharing will be required. Although many commentators assume access and benefit-sharing are always linked in some way, this point is not yet clear legally.

Like PIC, the ABS concept of MAT seeks to ensure that the source country or provider, rather than or in conjunction with a user from another country, will determine which ABS requirements apply to each contract.[112] MAT provisions are a strong statement that the ABS rights of the source country require more than simply contractual mutuality. For ABS contracts to be enforceable their parties must separately comply with the contractual rules for ensuring that a contract is fair and enforceable, on one hand; and the sovereignty, equity and other principles underlying ABS on the other. It will be critical to ensure that the negotiations satisfy the underlying purposes of both types of MAT.

2.4.3.3 Contracts that are accepted by action (shrink-wrap and click-wrap)

An important part of contract law is the idea that a contract may be created by 'action,' even if the parties have not formally agreed, or if the contract document would otherwise be considered invalid or unenforceable. This concept protects the party who takes action. If the other party accepts the actions (or transfer of material) then the law claims that he has agreed to a '*de facto* contract' or 'assumed contract' – i.e., that a contract exists without a valid formal 'agreement.'

In recent years, the concept of acceptance-by-action has been used in other ways as a different type of protection. These new innovations are normally called 'shrink-wrap'/'click-wrap' contracts. These contracts have a special importance in ABS, having been adopted and further adapted to be elements of the ITPGRFA and the SMTA. It is hoped that these developments will pave the way for a greatly simplified legal means of addressing some aspects of ABS.

In its most common use, the shrink-wrap/click-wrap contract is a formal written contract which says that the buyer will not take certain actions that are forbidden by law, such as infringe the seller's copyright and/or pat-

109 CBD, Arts. 15.4 and 15.7.

110 This last term means that, for some countries, a contract cannot exist if it is unilateral (with only one party committing to any action, payment, transfer of property, etc.) In countries that require 'consideration', there must be some mutuality of obligation – that is, the receiving party must give something in return. This requirement is tenuous where a law or contractual practice says that a 'token consideration' – i.e., payment of US $1 – can convert an agreed gift into a binding contract.

111 Compare Ten Kate and Laird, 2002 (which states that benefit-sharing only applies when linked to an access contract), with Tvedt and Young, 2007 at 3.3. Other discussions suggest that the contract must be renegotiated (come to new MAT) at least once after the contract has been bound. *See* Glowka, 1998. Under contract law, the original contract would probably not be binding on either party in this case, since the contract would fail basic legal tests, such as 'definiteness.' (*see* § 2.4.2.2)

112 Current trends are seeking to maximize the recipients' control over technical assistance. *See*, for example, the GEF Resource Allocation Framework (RAF), which gives recipient countries a voice in selecting projects and activities that can be funded in their country. The RAF is available online at http://www.gefweb.org/documents/council_documents/GEF_C27/documents/C.27.Inf.8.Rev.1_RAF.pdf. For further information *see* Hårstad, 2005.

ent (by copying the software for commercial purposes or sharing it with more than a specific number of other computers) or take other actions that are legally forbidden. The contract may also specify the seller's rights and obligations in the event that the software proves defective. The contract need not be accepted in any conventional way. The contract is accepted when, the buyer opens the shrink-wrap in which the product is packaged, or clicks on a computer tab that says 'I accept.' If he does not want to accept, he must return the unopened package (shrink-wrap contract) or click the 'I do not accept' tab (after which the system will prevent him from downloading the software.) Virtually any person who acquires software or other electronic property from a legitimate vendor online or who legally obtains a CD or other protected material directly or indirectly is bound by the shrink-wrap contract.[113]

The legal effect (validity and enforceability) of shrink-/click-wrap contracts has not yet been confirmed. There are three main reasons that some contract lawyers question the validity and usefulness of these tools.

- First, shrink-wrap and click-wrap contracts reverse the 'acceptance by action' concept.[114] When created in law, that concept is designed to protect the weaker or less experienced party to a contract. When that person gives property or services in the expectation of future action or payment. It protects those sellers legal right to insist on payment, even if the contract is flawed or unenforceable. By contrast, shrink-/click-wrap is used by the larger, stronger party to bind smaller and individual purchasers.[115]

- Second, some shrink-/click-wrap contracts may be 'contracts of adhesion,' especially when used by the stronger party in the transaction.[116]

- Third, shrink-wrap and click-wrap contracts are only valid against users who have acquired a CD or other software directly. These concepts assume that the user obtained the item from a legitimate vendor, and either clicked his acceptance or opened the shrink-wrap. Many other users (*e.g.*, subsequent transferees or purchasers from an illegal source) are not bound. In some cases customs officers or mail-room staff (not authorized to bind their employer) may break the shrink-wrap or click the acceptance box.[117]

Up to now, the software industry has responded to these concerns by limiting the coverage of the shrink-wrap and click-wrap contracts to actions and promises to do things that are already required by law – i.e., promises not to infringe the seller's copyright/patent and not to use the software for illegal purposes.

This raises an important question – *If its terms are so limited, why would a seller use a shrink-wrap or click-wrap contract?* The apparent answer is that[118] it is very difficult to enforce national laws (including IPR law) against purchasers in another country. The shrink-/click-wrap contract converts seller-country law into a contract. In that way, those provisions are easier to enforce.[119] The next section discusses the manner in which the ITPGRFA uses shrink-/click-wrap and the primary weakness of these concepts in applying them to ABS.

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113 Although shrink-wrap/click-wrap contracts are used every day, there is not yet any clear national or international law addressing their validity and enforceability. In deciding to use this mechanism in the ITPGRFA, the negotiations noted that the process needed for 'validation of such contract forms in national systems of law is still in its early stages.' Moore and Moore, undated.

114 As discussed in 2.3.2, above under the term 'reliance.'

115 *See* 2.3.1.2, above.

116 (*See* 2.4.1.4, above.) Shrink-/click-wrap contracts raise some question about whether the software purchaser has any actual knowledge of the contents of these contracts. Many persons admit that they simply click 'accept' without any serious attempt to read and understand what they are accepting. This failure to read the fine print is a classic indicator of a contract of adhesion. In the ITPGRFA's negotiations, this issue was discussed by the Interim Committee for the International Treaty on Plant Genetic Resources for Food and Agriculture. Moore and Moore, undated.

117 A court might require proof that the person holding the software actually opened the wrap. Such proof that may be problematic, especially in international material transfers, where packages are often opened on loading docks, in mailrooms, in individual offices, or in customs. None of these persons is authorized to adopt a binding contract on behalf of their employer The ITPGRFA, having noted that most shrink-wrap parcels containing plant germplasm are opened in customs, is working to develop systems to address this ambiguity and ensure that it does not invalidate shrink-wrap SMTAs.

118 1.2.6, and *see* Cabrera and Lopez, 2007; at 1.2.4, 1.2.5, 2.1.5 and 2.6, in Tvedt and Young, 2007; at Chap. 3 and Young, *et al.* 2007, at chap 11.

119 *See* Convention on Biological Diversity. 2007.

2.4.3.4 SMTA and shrink-wrap/click-wrap concepts

As used in the ITPGRFA, shrink-wrap/click-wrap mechanisms have been extended rather far beyond their use in the software context. Even before the Treaty shrink-wrap contracts have been used in the transfer of plant germplasm from International Agricultural Research Centres (IARCs) cooperating through the Consultative Group on International Agricultural Research (CGIAR).[120] Any recipient of IARC germplasm became bound to the CGIAR's 'material transfer agreement' by opening the package containing the seeds or other material. More recently, the new 'Standard Material Transfer Agreement' adopted under the ITPGRFA specifically adopts the shrink-/click-wrap approach, but states that it may be accepted in any of three ways – by signature, by clicking an electronic acceptance in the material provider's website, or by opening the 'shrink wrap' containing the material.[121]

The SMTA imposes many obligations on the person who clicks or who opens the shrink-wrap. Some of these extend far beyond the type of coverage used in the software industry. For example, the SMTA imposes obligations[122] on the recipient to

- Recognize the Secretariat of the ITPGRFA as a 'third-party beneficiary' to their plant germplasm transfer contract with separate rights of information and oversight[123];
- Limit his use of the material to 'purposes of research, breeding and training for food and agriculture. Such purposes shall not include chemical, pharmaceutical and/or other non-food/feed industrial uses.'[124]
- Make the material available in future, to the extent that he conserves it, through the Multilateral System (MS) of the ITPGRFA.[125]
- Comply with further requirements if he later transfers the material he has received under the contract to other persons,[126]
- (perhaps most important) either
  - make any product that he creates using the material available to other researchers for their use without restriction, or
  - pay a fixed percentage of the Sales of the commercialized Product (currently 1.1% of the amount equal to 70% of the gross income from sales of the product) or, to avoid the record-keeping involved, pay a 'discounted option amount' over a period of years.

  In either case, the amount shall be paid into the Fund established under Article 19.3f of the ITPGRFA,[127] and
- transfer that responsibility to any person obtaining his patents on such product;
- share 'all non-confidential information that results from research and development carried out on the Material,' with all other researchers, through the information system created under the Treaty;[128] and
- submit to arbitration and agree to the application of UNIDROIT's legal standards in the interpretation of his duties under the contract.[129]

120 Discussed in Moore and Tymowsky at page 119-128.

121 ITPGRFA, SMTA, Article 10. Under the SMTA, the choice among these options is expected to be a formal decision ('the Provider and the Recipient may choose the method of acceptance.') In practice, however, the collections usually allow the recipient to choose the method.

122 In addition to the listed items, the SMTA includes a number of other requirements. It is arguable (and often argued) that these are required by law, and thus no different from the more conventional use of shrink-wrap/click-wrap mechanisms. *See* SMTA Art. 6.2.

123 SMTA, Art. 4.3 and 4.4. The concept of third party rights is discussed below, at 2.6.3.

124 SMTA, Art. 6.1.

125 SMTA, Art. 6.3.

126 SMTA, Art. 6.4 and 6.5.

127 SMTA, Art. 6; Annex 2; and *see* definition of 'Sales' in Article 2.

128 SMTA, Art. 6.9. The information system is created under ITPGRFA Art. 17.

129 SMTA, Art. 6.4 and 6.5.

There is no doubt that these are all valid contractual obligations. What is unique is that they may be imposed without formal signature by the user. By using shrink-wrap/clickwrap, the SMTA may bind the recipient, even if he has not read or understood the contract, but simply opened the wrapping or clicked his acceptance. Under normal principles of 'adhesion' (discussed above), the SMTA would appear to be a classic 'take-it-or-leave-it' contract. It is not a 'contract of adhesion, however, for three reasons. First, the international negotiations that created the SMTA were undertaken in a way that was very protective of the interests of all potential parties to the contract. Second, the SMTA's terms are clearly designed to offer benefits and responsibilities in an agreed and balanced way. Third, and most important, SMTA is only available to agricultural researchers and developers of plant varieties for food and agriculture – expert groups whose interests were clearly addressed in the negotiations.[130] The ITPGRFA does not specifically state an affirmative duty of the providers of resources under the MLS to ensure that only agricultural researchers and variety developers use the resources, but it is clear that the parties had this expectation. As such, the Treaty imposes a duty on the IARCs and other facilities within the MLS to screen users. Assuming that only highly knowledgeable experts within this relatively small international profession use the MLS's shrink-wrap and click wrap contracts, then a court or arbitrator would be more willing to consider click/shrink SMTAs to be binding on these persons (i.e., not contracts of adhesion.)

In addition, of course, the same basic concerns described in 2.4.3.3, above also pose challenges to the further legal development of the SMTA.

2.4.3.5 Other possible ABS use of click-wrap concepts

The SMTA's use of shrink-wrap and click-wrap contracts, suggests other innovative possibilities for the use of the shrink-wrap/click-wrap mechanism in ABS. For example, it might be possible to 'click-wrap' a country, requiring all persons entering and leaving the country to click (or otherwise signify) 'I accept' to a contract which states that they may not collect biological samples for the purposes of using their genetic resources, or of transferring them to others for such use. If they do not signify acceptance, they could be prevented from entering the country. If they do accept, however, they would be contractually bound to comply with the country's bioprospecting and ABS rules, and their obligation may be enforceable under contract law in courts in the user country or elsewhere.[131] Given that many countries already maintain records of every person who enters and leaves the country, this wrap system would not place added burdens (inspection, etc.) on customs officials. Their only job would be to ensure that each person clicks (or otherwise signifies) their acceptance of the contract.

2.4.4 Assignability, transfer and the rights of third parties

Two other contractual areas that may affect enforceability and the objectives of ABS contracts relate to the assignment of rights and duties under a contract and the recognition of 'third party rights under a contract.' These two issues connect to a third – whether and how contracts may restrict the later use of genetic resources. There are many differences among countries in how they address these issues. In addition, ABS adds new and different questions, which are currently undecided and somewhat controversial.

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130 Although the ITPGRFA is not clear about this point, it may be reasonably inferred from the following provisions:

Art. 7.2(b) – 'National Commitments and International Cooperation': *International cooperation shall, in particular, be directed to… (b) enhancing international activities to promote conservation, evaluation, documentation, genetic enhancement, plant breeding, seed multiplication; and sharing, providing access to, and exchanging, in conformity with Part IV, plant genetic resources for food and agriculture and appropriate information and technology.*

Art. 12.3(a) – Facilitated access to plant genetic resources for food and agriculture within the Multilateral System: *Such access shall be provided in accordance with the conditions below: (a) Access shall be provided solely for the purpose of utilization and conservation for research, breeding and training for food and agriculture, provided that such purpose does not include chemical, pharmaceutical and/or other non-food/feed industrial uses.*

131 As noted in Convention on Biological Diversity, 2007a, (and see, Young 2006a, and Tvedt and Young 2007), it is very difficult to enforce national laws and regulations in foreign courts. One cannot eliminate all enforcement problems by using contracts, but it is much easier to get access to and action in foreign courts where the action is based on contract.

2.4.4.1 Restrictions on transfer of the *res*

The transfer of genetic material is one of the most difficult challenges of the ABS regime. Some aspects of the benefit-sharing and enforcement objectives in the regime are difficult to apply if the resources are transferred, under current legal systems. Conventional contract law addresses the transfer of the *res* in a few limited situations. Normally, however, the buyer of goods believes that he can do whatever he chooses with them, once he has completed the purchase. This general rule is not always correct. Several factors may justify restraints on transfer including the following:

(i) the underlying purpose of the contract may require restrictions on future transfer of the *res*. Such provisions are normally discouraged in law, unless there is special justification.[132]

(ii) the purchaser may not have purchased all rights with regard to those goods. For example, even after purchasing a copyrighted book, photograph or software program, the purchaser may not copy the item for commercial use. Some intellectual property rights are virtually unlimited in time, meaning that this restriction could continue for as long as the person owns the book, even if the publisher from whom it was purchased has ceased to exist and the author has died.

Transfer of rights and duties under an ABS contract may be subject to different legal principles. Depending on national law and the intent of the parties, restrictions on transfer may be legally justified. If national law considers 'genetic resources' to mean only physical specimens (samples), then one would normally expect few limitations on transfer. If 'genetic resources' includes an intangible or informational component, then transfer could be subject to restrictions (which may be very difficult to enforce). The international regime negotiations will have a significant impact on the assignability of rights under ABS contracts already in existence or being written now.

2.4.4.2 Assignment of contract rights and duties

Connected to the physical or legal transfer of the *res* of a contract, each contract must consider two additional questions:

(i) whether a party may formally assign his contractual rights and duties, and

(ii) whether the other party must approve this assignment.

In a majority of contract-related transfers, only the second question matters. The party is allowed to assign his *rights* as he chooses. He will only have to seek the other party's consent in order to assign the *duties* owed to that party. There are a few exceptions to this rule, depending on the type of resources, rights or duties being assigned. If the rights/property and duties are inextricably linked together, then the other party may have a right to refuse his consent to that assignment. These rules are very difficult to interpret in individual contracts, but they apply only when the contract does not specifically address the issue.[133]

Many ABS cases to date have involved transfers of genetic resources without formal assignment.[134] These disputes essentially claim that both the original user and the transferee will be liable for benefit-sharing in the event of such transfers. ABS contracts will be less risky where the parties can come to some agreement clarifying whether formal assignment and permission are necessary when transferring the genetic material and/or transferring the benefit-sharing obligation.

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132 Consider, for example, a donor who wants to give his art collection to his local museum, with the stipulation that it may never be sold or donated to any other institution. Usually, once the donation is complete, the restriction will no longer apply. To achieve his wish, the donor will have to change the transaction. Instead of donating, for example, he can *lend* or *lease* the collection to the museum on a long-term basis. This keeps the transaction 'alive' (as a continuing loan rather than a completed donation) so that the stipulation will continue to prevent further sale or transfer of the collection.

133 A transfer of ABS contract rights, duties and resources may create legal problems such as ambiguity in defining the benefits shared and the need to determine how a claim may be presented, in the event of a post-transfer violation. The user's obligations in ABS obligations often include answering inquiries and reporting on activities through the years following the original transaction. To remain in compliance with such a requirement, the user who has transferred some of the genetic resources would have to maintain and report oversight of all persons to whom the resources have been transferred.

2.4.4.3 Third-party rights

A third element of the contract which is critical to ABS is the issue of 'third-party rights.' Under conventional contract law, the general rule is that a contract only binds its own parties (and their assignees), and that they are the only persons who have rights under the contract. It can sometimes recognize rights of a 'third party' (one who is interested in the contract, but not directly bound by it); however, but only in special situations. This third-party beneficiary may have some rights, if he is an 'intended beneficiary' of the contract, but not if he is an 'incidental beneficiary.'

- An *intended beneficiary* is someone named or particularly identified in the contract as a recipient of some kind of benefit, which is a direct objective of the contract.

- An *incidental beneficiary* receives some type of benefit in the contract, but that benefit is not a purpose of the contract.[135]

The intended third-party beneficiary may be specifically named in the contract, or this status may be determined from the effects of the contract. Typically, the former is preferable for the parties, as they can then be very precise about the particular rights intended and the scope of those rights.

ABS contracts, by nature, involve many types of third-party beneficiaries. For example, the SMTA specifically names the Governing Body of the ITPGRFA as a third-party beneficiary. Under this provision, the Governing Body may take action to enforce SMTA's reporting obligations. Another group of beneficiaries under the SMTA are those who receive (or hope to receive) payments from the ITPGRFA's Fund.[136] The SMTA does not mention their status, but they are clearly intended to be third-party beneficiaries.

In other ABS situations, members of the civil society have sometimes asserted rights under the contract or alleged that the contract was not legally granted because it failed to take their rights into account. Here also, it will be useful if the ABS contracts can specifically address the rights of non-Parties who claim to have rights in genetic resources. It may not be possible for the parties to cut off third party rights in ABS, which are created by statute in some countries. By clearly discussing those rights, however, the parties stand a better chance of creating a legally certain contract, and decreasing their risk of external challenge.

2.5 The taxonomy of contracts – what's in a name?

A multiplicity of document names have been used as titles of various ABS contracts. Although sometimes confusing, the selection of a particular title does not limit the nature of the document and its legal implementation, which is determined by all of its terms and contents, regardless of the instrument's title. Thus, for example, a document may be titled 'memorandum of understanding' (a contractual type that is generally considered non-binding) may be a binding if its contents (i) are expressed in binding terms and (ii) meet the requirements of validity and enforceability.

There are some situations, however, in which an instrument's title may have a legal effect. This is most common when a law specifies special requirements applicable to a particular form or category of document.[137] In addition, the instrument title may impact the interpretation of a contract in countries whose national contract law makes a distinction between 'commercial contracts' and 'civil contracts.'[138] Hence, there may be many reasons to choose a particular title or instrument type.

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134 *See* Young, 2006a.

135 For instance, a contract may designate a particular bank or trust company as the fiduciary that will hold certain property or payments from one party, and verify the other party's compliance before paying out these funds or transferring the property. The trust company earns a fee for this service, but that benefit (to the trust company) was not a purpose of the contract. The trust company is thus an unintended beneficiary.

136 *See* ITPGRFA, Art. 19.3f.

137 In some countries, for example, if a legal document is titled a 'deed' or 'mortgage,' that title will be presumptive evidence of the party's intent.

138 *See* footnotes 4 and 13 and accompanying text.

As discussed in Chapter 3, many countries have adopted form ABS contracts, with specific mandatory names and formats. In other situations, ABS contracts have taken many different titles. Although far from comprehensive, Table 2 provides a very brief comparison among a number of different instrument titles. It is offered as a starting place for the negotiator's research.

Table 1 Some comparisons among various types and titles of instruments

Instrument Name[a]	Generic types of agreement		
	'Contract' or 'Agreement' or other term meaning 'Binding Instrument'	Letter agreement	'Letters of Heads agreement' [c]
Presumption about intent to be bound[b]	Normally: Binding, as to at least some provisions	Normally: Binding, as to at least some provisions	Less clear, possibly interpreted as 'binding'
Role and usage in other sectors	Generally, use of terms such as agreement or binding instrument are used in any document intended to create legal obligations / relationships between two or more parties.	Generally used in situations in which a full and detailed instrument is not perceived to be necessary, usually because the agreement is one part of a continuing relationship of many such agreements and/or in situations which are so well covered by law and industry practice that a simple agreement will be enough to give definiteness.	The use of the term 'of heads' in the title suggests that this instrument might be an MoU or other non-binding instrument in intent (i.e., that it is not binding on the institution only on the 'heads').
Role and usage in conservation/ sustainable use/ biodiversity	Ditto.	As above.	As above.
Actual or possible relevance to ABS contracts	Not limited.	Presumably, if the international regime is developed and implemented by national law in both the user and provider country in a particular transaction, then it will be possible to simplify ABS contracts, possibly to the level normally found in a letter agreement.	Not limited. In particular might be a useful approach where the instrument is not intended to bind the agency.

continued on next page

a The possible document names, even when limited to ABS-related instruments, are far too numerous to mention, hence these examples focus on particular aspects and implications of the name (i.e., a 'Bioprospecting Agreement' might, for these purposes, fit under the heading of " 'Contract' or 'Agreement' or other term meaning 'Binding Instrument' ").

b As discussed in text, the title of an instrument is not dispositive regarding whether that instrument is binding or not, and is not usually legally actionable.

c Although not a standard or familiar type, the 'letter of heads agreement' it is inserted in the table as an example, based on one of the agreements reviewed in researching this book.

Table 1 (continued)

Instrument Name	Specialised transfers, interests and rights	
	'Deed of Trust', 'Lien', 'Performance Bond', 'Charge on Property' etc [d]	'Easement', 'profit', 'usage right', etc
Presumption about intent to be bound	Binding. Creates a limited but control-based interest for a non-holder of the property.	Binding. Designed to grant a limited right – holder to have a partial interest.
Role and usage in other sectors	Used in finance and other situations in which a person not in possession of property needs to have a legal right over the property, including in subsequent products made using the property.	Used in property law to grant a person a limited right in the property (to enter it, cross it, collect produce from it, or utilise it in some way) – normally applicable only to land and other immovable property.
Role and usage in conservation/ sustainable use/ biodiversity	In PA-related transactions, transfers of endangered or protected species for non-commercial use, etc., a lien or charge may be used to maximise the country's options and rights, if conditions on the transfer are violated.	Many countries and organisations use 'conservation easments' and other limited rights as tools for ensuring conservation of lands held by private holders.
Actual or possible relevance to ABS contracts	Possibly, some kind of trust deed or other bond or charge might be more easily enforceable and more parallel to the relationship that ABS parties envision.	The ABS contract may be thought by some to be a limited transfer, or a separate set of rules governing only part of the property transferred. If so, ABS contracts may learn from the experiences regarding the transfer of limited rights in property.

d Normally, financing instruments, deeds of trust, mortgages, charges on land, performance bonds, are used to secure payment. They may also be used, however, to secure other types of actions and situations in which one party has a right relating to property but is no longer in control or possession of that property. The main difference between a deed of trust (or similar instrument) and an easement is this: an easement is a grant of a full or partial right of possession and focuses on that possessor's right, while the holder of a deed of trust, etc., is normally a non-possessor retaining certain rights in the property.

Instrument Name	Special instruments applicable to specific categories of property or activities		
	Research Agreement	Distributorship and Commercial Agency agreements [e]	Development Agreement
Presumption about intent to be bound	Normally: Binding, as to at least some provisions.	Binding.	Binding.
Role and usage in other sectors	Most commonly, this type of agreement is used to create a specific control on the ownership of data and material transferred and to clarify who is the owner of any research results and discoveries, during the research/analytical phase (i.e., prior to patenting).	Used to transfer rights to distribute products manufactured or to grant rights of production and distribution of products of protected technology.	Used to transfer rights to use protected technology for purposes of scientific research or development of commercial applications.
Role and usage in conservation/ sustainable use/ biodiversity	Research agreements have been used by countries or conservation agencies to ensure that they will have a right to data, samples, analysis arising out of specially permitted research.	Sometimes used in downstream transfers of genetic resources.	Sometimes used in downstream transfers of genetic resources.
Actual or possible relevance to ABS contracts	There may be lessons for ABS parties to learn from commercial and conservation research agreements regarding how to determine what information is shared, the rights/duties of a party receiving data and other elements.	As above, perhaps extendable to provider contractual relationships.	As above, perhaps extendable to provider contractual relationships.

e 'Distributorship and Commercial Agency Agreements': A number of specialized contracts are relevant to ABS for various reasons. National law sometimes recognizes special elements of these instruments. For example, in Japan, there are clear differences in the legal effect of a 'commercial agency agreement' as compared with a 'distributorship agreement,' which are objectively very similar in terms of what the parties are required to do.

Table 1 (continued)

Instrument Name	Special instruments applicable to specific categories of property or activities (cont)		
	Contract for Sale of Goods	Material Transfer Agreement	Licensing Agreement
Presumption about intent to be bound	Binding.	Normally: Binding, as to at least some provisions.	Normally: Binding, as to at least some provisions.
Role and usage in other sectors	Many specialised rules and assumptions have been adopted to govern specific contracts for the sale of goods, which are not available to contracts that do not meet this description.	In some cases, this is simply a 'contract'; however in others the name connotes that the transfer is limited to particular post-transfer use or purpose, and even where no money is paid, the transferee is making a commitment to use the material only for those purposes.	Used as a tool to transfer the right to use property. Applicable to immovable, movable and intangible property. Strong, well documented usage viz 'intellectual property' where, e.g., holder of a patent grants licenses to others to use, manufacture or take other action controlled by the IPR.
Role and usage in conservation/ sustainable use/ biodiversity	Not applicable, except where the conservation activity involves a standard commercial sale of 'goods' as defined in the law.		Primarily used to license persons to use or manage protected areas, but some other uses.
Actual or possible relevance to ABS contracts	Some ABS agreements, notably the SMTA, assume that the transfer of germplasm is a sale of 'goods.' Other instruments would not appear to do so.	Some negotiators in ABS discussions are promoting that all ABS transactions should use a standardised MTA (possibly different ones for different industrial sectors).	Users of genetic resources particularly those who have obtained patents utilising those resources, typically license their new innovations and other patent rights to others whether for further development or for management and production of the patented innovation. This is a primary way that some users obtain benefits from their utilisation of genetic resources.

Table 1 (continued)

Instrument Name	Special protections		Other instruments
	Non-disclosure / confidentiality agreement [f]	Guaranty or Surety (including insurance)	Statutory permit
Presumption about intent to be bound	Binding.	Binding.	Binding within the country where the permit is issued, may in some cases be interpreted as a contract.
Role and usage in other sectors	Similar to a 'research agreement' in focusing on rights and duties of those who do not 'own' the information. ND/C agreements focus greater attention on the obligations of parties after their other relationship has ended, and on guaranties protecting the parties in case of breach.	Creates a separate financial right, which the ensured party may call on in the event of certain losses or violations under another contract. Normally, the surety under a guaranty/surety contract is not a party to the other contract.	Used wherever the law states that some action is prohibiited without permission, or that a permit is required. They specify the requirements and conditions that must be met by the permit-holder in order for the permit to remain in effect.
Role and usage in conservation/ sustainable use/ biodiversity	In rare cases, conservation practices and technologies are developed that are offered to protected areas, wildlife agencies and others subject to confidentiality and other restrictions.	Some governments and other conservation agencies and organisations require guaranty/surety agreements in sustainable use situations, as a way of ensuring that any ecosystem harm caused by the 'sustainable user' will be repaired or compensated.	Many governmental agencies may prefer to authorise uses and extraction of natural resources and other biodiversity rights by permit rather than contract, because the procedures for issuance and for revocation are normally both easier and faster.
Actual or possible relevance to ABS contracts	Confidentiality agreements are often employed by the user when engaging researchers, licensing discoveries and in other contexts. It is possible that confidentiality agreements could be useful, particularly in situations where benefit-sharing focused primarily on 'results of research' under Article 15.7	Some analysts have suggested that insurance or other surety arrangments could be developed to protect source countries against ABS violations. Challenges would be the extreme length of some ABS arrangements, and the need to define specific insurance-like standards for determining when an ABS violation has occurred and what compensating payment or other action would be needed to address it.	Some source countries rely solely on permit provisions to serve as ABS contracts. This may raise doubts about whether it is possible to obtain remedies against a user for violating his permit, when the user is outside of the source country. This question requires further investigation.

f The 'confidentiality and non-disclosure agreements' mentioned in the table are specific instruments. They should not be confused with the paragraph which appears in many agreements labeled 'Confidentiality' or 'Non-disclosure'. The later provision simply requires the parties to a contract to keep some or all of the terms of the contract confidential. The 'confidentiality and non-disclosure agreements' described in the table relate to genetic information and research results generated regarding the GR, rather than to financial matters.

Table 1 (continued)

Instrument Name	Other instruments		
	Letter of Intent	MoU	New titles and categories
Presumption about intent to be bound	Non-binding.	Non-binding.	No presumption.
Role and usage in other sectors	Often called a pre-contract, a letter of intent helps to set the basis for future work, enquiry and negotiations.		Use of non-standard names is usually intended to ensure that the instrument is given a standard classification. For example, to avoid automatic classification as a 'contract for the sale of goods' or a 'material transfer agreement', a contract may be called 'Grant of right to collect, sample and remove wild germplasm'. At other times titles are combined for less obvious reasons. Commercial transactions often use a 'Memorandum of Agreement' or 'Memorandum of Contract' – raising immediate questions as to binding nature and intent (i.e., is it more like an MoU, or more like a contract?)
Role and usage in conservation/ sustainable use/ biodiversity	MoUs have been used in many ways. Being non-binding, they are more easily processed to gain approval or signature. Their non-binding nature can allow countries to test new ideas, such as 'harmonised standards' without binding the country permanently. The countries can know before formally adopting them how those standards and procedures will function in practice. MoUs frequently reflect a nonbinding ongoing relationship, goodwill or cooperative mechanism between conservation NGOs (and sometimes IGOs or governments). .		
Actual or possible relevance to ABS contracts	If the international regime finds ways to use incentives/motivations effectively, users will have reasons to comply without the use of detailed binding contracts. In that case, letters of intent and MoUs may take on a new importance, streamlining the relationship between user and provider, while providing documentation of both sides' agreements and expectations.		???

2.5.1 Contracts vs. statutory permits

One frequently asked question relates to the difference between an 'ABS contract' and an 'ABS permit' (or 'bioprospecting permit.') In some countries, a statutory permit is used to address the issues, rights and duties that are in other situations addressed in ABS Contracts. In some countries, both are possible: the user would get a 'permit' if he deals with one agency or community, but a 'contract' if he deals with another community or agency in the same country. Some countries use a different term (neither 'permit' nor 'contract') and do not make it clear which type of instrument is involved.

General contractual principles commonly note that, from the perspective of the government agency, the primary difference between the use of statutory permits and contracts is administrative simplicity. The processes and standards for permit issuance are often streamlined, when compared with contract negotiation. Permit processes are set by statute or regulation, and usually designed by the agency or official who will do the work of issuing the permit. When compared with the process necessary for a country or agency official to get permission to execute a binding contract on behalf of the country, permit processes normally require less internal 'red tape' and fewer mandatory approvals from higher officials. Similarly, revocation of a permit may be quicker and more effective than terminating a contract. In addition, in the source country, permit enforcement is usually easier than bringing contractual action for redress.

At the international level, the situation is quite different. Enforceability of national permits is much more difficult, as compared with contracts, when the enforcement occurs outside the source country. Foreign courts are often unwilling to enforce another country's national law, even where they have the legal authority to do so, but do enforce contracts from foreign countries. While a permit might have the same legal force as a contract within the source country, its enforcement may be much more difficult when dealing with a user and genetic resources

located in another country.[139] Other government-issued instruments (licenses, memoranda, etc.) fall between a permit and a contract, and their enforceability may be difficult to determine.

2.5.2 Specialized types of contracts

Finally, it is useful to consider the possible role of 'specialized contract law' – that is, individual laws that apply only to particular kinds of contracts. There are many kinds of specialized contracts that are governed by special laws. Some types of transactions such as lending, insurance, transfers of shares in companies, and patents all are governed by special laws in nearly all countries. In some countries, for example, a court or arbitrator evaluating a dispute or interpreting a contract must first determine whether that contract is a 'commercial contract' or a 'civil contracts' or whether the parties were 'mercantile enterprises' or not.

It may be difficult or impossible to apply specialized laws to ABS, unless the legislative bodies have specifically enabled and authorized this application. For example, the Convention on the International Sale of Goods (CISG) is applicable only to 'international contracts for the sale of goods'. It is not applicable to other kinds of contracts. For this purpose, the CISG defines the concept 'international contracts for the sale of goods' very precisely.[140] This means, for example, that it may not be legally useful to interpret an ABS contract as an 'international contract for the sale of goods' until the affected countries' laws have all determined that *genetic resources* are '*goods*' for this purpose. A CISG contract must transfer items that have already been 'produced,' suggesting that 'intangibles,' immovable property and bulk transfers of raw materials are not covered.[141] Similarly, in ABS the laws governing land and 'immovable property' may be potentially relevant, if national law or the contract clarifies which category of property includes genetic resources.[142]

If a contract is not 'international' or is not a 'sale of goods,' then CISG principles are not intended to apply. As a practical matter, they may not address relevant points, and application of the CISG principles may not provide a fair and reasonable outcome. ABS contracts can specify the application of CISG or other commercial contract principles; however, it is not clear that those principles will enhance the courts' understanding of, or ability to interpret, ABS terms and concepts that are currently not fully understood.

It is possible for one or more countries to develop specialized contract law for ABS contracts; however, no country has done so up to now. In developing such provisions, it may be useful to consider other types of specialized contract law, which may offer interesting analogies and approaches.[143] One possibility, discussed below, which is currently under study, involves the development of a system similar to modern 'antitrust law,' which has many parallels to the ABS regime, both in terms of the balance of legislative objectives to be served (to protect citizens, consumers and competitors against commercial activities that harm the national economy and commercial structures, while not unduly interfering with com-

139 In ABS, many (perhaps most) claims of violation arise when the user and the genetic resources are outside of the source country. Young, 2006a. It is important to remember that, although the currently envisioned ABS framework involves only one source country, it may involve more than one user country. The particular user who obtains the ABS contract may operate (or conduct research activities) in more than one country, may provide the samples to other researchers under contracts for specific work, or may transfer the genetic resource to other users.

140 CISG, Art. 2; *and see* Folsom, 2004 at 28, *et seq*. on the extent to which this definition excludes other kinds of transactions and raises questions about other kinds of contract.

141 Currently, for example, courts are split over whether a contract for standing timber constitutes a transfer of 'goods' under that Convention, because (i) they have not been produced until standing timber has been harvested; and (ii) some argue that standing timber, being affixed to the ground, is immovable property. Folsom, *et al.*, 2004.

142 At most, biological specimens (plants) taken might be 'severable' from property, which under some countries' law would mean that they are the property of the landowner or landholder, but in other countries this might not be the case.

143 Currently, in ABS, there are many apparently different views about what category might be used to interpret and enforce ABS contracts. Some commentators address ABS contracts and related discussions as if the transaction were a sale of goods. *See,* e.g., AUSTRALIA 2002, 'Nationally consistent approach for access to and the utilisation of Australia's native genetic and biochemical resources,' available online at http://www.cbd.int./abs/measure.shtml?id=7805. Others view it as a transfer of something similar to intellectual property. *See,* e.g., Shiva, V. Undated. 'Free Trade Industrial Agriculture Rules Threaten the World's Farmers: The World Trade Organization Trade Related Intellectual Property Rights Agreement', available online at http://www.ifg.org/pdf/int'l_trade-shiva_WTO.pdf_1.pdf. Still others assume that the issues involved should be governed by the law of land and immovable property. *See,* CBD Secretariat, 2007b.

mercial practice and income generation) and in terms of the complexity and flexibility needed to ensure that the regulatory system works fairly for both users and providers.[144] Similar discussions arise frequently regarding 'intellectual property rights,' which are, in some aspects, parallel to ABS. These laws exist in many countries, but are focused narrowly on particular properties that are defined by statute.[145] Useful lessons may be gleaned from examining these laws, but they probably cannot be effectively used in ABS contracts until special provisions have been adoped through the national legislative process, regarding how they apply to ABS.

2.6 Special issues

'Internationality' and 'trade' present important challenges for commercial contracts, especially those that cross national borders. These are very important issues in ABS contracts. Although some countries regulate both domestic and foreign users of their genetic resources,[146] 'ABS contracts' under the CBD are international by definition – ABS rules apply only where a user from one country utilizes genetic resources with origin in another country.[147] In addition, *biological material* (as opposed to '*genetic resources*') may be legally taken without reference to ABS, and later transferred to users outside of the source country for use in genetic research. The initial collection and transfer in such a case may not trigger ABS processes; however, the later 'utilization' of its genetic resources may be covered by the ABS regime (depending on the results of the international regime negotiations.)[148]

Like all international commercial contracts, ABS contracts are subject to many rules and principles of international and commercial law, beyond the basic issues of multi-national contract implementation and enforcement.[149] The following sections briefly consider two such questions:

(i) the relevance of international trade law to ABS; and

(ii) a possible role for of antitrust law as a prototype for the ABS regime.

Since no country has adopted national legislation implementing Article 15.7 of the CBD, it is not possible to provide final advice on these issues – present opinions are, at most, speculation. The following sections only raise a few critical issues.

2.6.1 International trade controls and related issues

Initial examination of the impact of international trade law on ABS transactions has led most analysts to conclude that there is no real overlap between ABS contracts and international trade law.[150] Hence, the following is not a detailed analysis, but suggests possible justification for re-examination of the issue.

144 The possibility of using the IPR system, whether as a model or directly, as the ABS's implementation system was discussed in the Crucible Group's published conclusions – a useful resource on this issue. The Crucible II Group, 2000 and 2004.

145 Discussed in 2.6.2, below.

146 Three examples are Australia, Costa Rica and Brazil. Tvedt and Young, 2007, at 3.3.

147 CBD Article 15, in general.

148 Tvedt and Young, 2007, at 4.1 and 4.2.

149 Basic questions regarding international enforcement and remedies, discussed in detail in Young, 2007, are not reiterated here, except where they are directly relevant to contractual drafting.

150 An excellent initial paper laying out this fact was presented by Heike Baumüller, then at ICTSD, in a *Roundtable on the Practicability, Feasibility, and Cost, of Certificates of Origin*, (Vilm, Germany) 9-10 November 2007 leading inevitably to her decision that further analysis of the issue would not be productive. While a number of student and post-doc studies have examined the issue as a theoretical or hypothetical matter, the practical reality – that international trade law cannot force anyone to sell their property unless they choose to, and that no country will realistically want it to be otherwise – remains generally unassailable, in light of the impact of such a holding on other trade. Consequently, barring a major change, such studies can only be of academic interest.

2.6.1.1 International trade law and ABS Contracts

The various WTO requirements focus only on the questions of enabling trade by those who *wish* to sell their goods. Broadly speaking, no country is required to purchase (or commit to purchase) anything, only to open their markets to enable purchase in case anyone chooses to do so. Most important, *trade law does not require any country, entity or person to* ***sell*** *its resources to any other person, entity or country, whether domestic or foreign unless the seller chooses to do so*.[151] This overarching principle parallels national law, under which one normally has completely unfettered discretion to choose whether he wishes to sell or transfer his property at all, and if he chooses to sell, he may freely decide which buyer he will sell to.[152] There are only a few very limited exceptions to this principle, based on urgency and non-commercial issues.[153]

Where the resource is owned or controlled by government, there may be additional rules based on the government's duties of 'transparency' and 'fiduciary obligation' owed to its citizens. These duties are owed to the citizens of the country, and are often the basis on which public participation laws are founded. Apart from these, however, a governmental unit that is in charge of governmental property cannot normally be forced to sell that property.[154]

There are some types of governmentally held property that cannot, by law or policy, be transferred to any private person. This rule differs from country to country. Where the government seeks to sell, grant or acquire property of an ambiguous character (i.e., genetic resources), it may be necessary to determine whether that property is 'sovereign property' requiring compliance with fiduciary protections, 'public services' which must be offered to all equally if they are to be sold at all or property of some other type. These questions are sometimes legally difficult to answer.

2.6.1.2 Possible areas of further analysis

Despite the general conclusion noted above that modern international trade law does not appear to conflict with or affect ABS,[155] three points of recent discussion suggest a possible need to re-analyse some aspects relating to the role of trade in ABS.

First, in current discussions, some delegations have proposed in light of countries' commitments to grant each other 'access' to genetic resources, that the regime should require each country to ensure that all persons, regardless of nationality, have 'equal access' to the country's genetic resources. This language suggests that, in future, 'trade discrimination' principles may be applied to ABS – i.e., each country will be under a legal duty to enter into an ABS contract with any user for any of the countries' genetic resources at any time. If an attempt is made to develop such a policy, its impact on other national sovereignty issues – such as controls on foreign investors – may be both difficult and controversial in international commerce. Consequently, it may be important to further investigate the consequences that would arise, if all countries are required to provide 'equal access' to their natural resources and other wealth.

Second (perhaps an outgrowth or response to calls for equal access), some discussions have raised the possibility of another limit on international ABS contracts. They suggest that the right to collect and/or utilize ge-

151 To date, the authors are aware of no international cases claiming that a country or other entity has violated international trade law by refusing to sell its resources or other property at the request or demand of any person, nor has any case suggested that, where a government chooses to sell some of its resources to a particular buyer, it must give an equal opportunity and/or price to another buyer.

152 For example, a seller or provider of goods or services may sometimes be bound by a rule of 'non-discrimination,' where his business serves a 'public function' – providing services and commodities that should be available to all citizens without discrimination. In common law, this concept is clear, and it is well recognized that public functions are sometimes (frequently) performed by private entities. *See* Martin and Turner, 2006. In the United States, this concept is embodied within two larger concepts of 'equal protection under the law' (a right guaranteed by the US Constitution), and 'Civil Rights (embodied to some extent in the Federal Civil Rights Act of 1964.)

153 *Ibid*. In addition, national law sometimes includes special emergency provisions, under which private property may be taken without the owner's approval, in times of dire emergency, or where the owner made a promise of 'non-competition' at the time that he acquired the property. *See* Jefferson, 1996, at part 1.

154 The fiduciary is not always required to take the best price, but may consider other factors in determining which is the best deal in the interests of the country.

155 The WTO tribunals have regularly surprised all sides by their unique conclusions in environmental cases. Consequently, the authors cannot be certain that ABS will not at some point be subject to scrutiny by a WTO tribunal. Until such a case is filed, however, analysis of what would happen if WTO did apply to require countries to provide access to genetic resources continue to be primarily academic speculation.

netic resources should only be granted where the user promises to use the genetic resources only in countries that have adopted 'user measures' implementing Article 15.7.[156] This provision, too, may have global trade impacts.

Finally, a few analysts have suggested that there is a body of 'genetic-resource issues' which might usefully be considered together. These analysts propose merging the following into a single unified regime:

- biosafety (the introduction of living modified organisms – i.e. products of the utilization of genetic resources);
- alien species introduction (including products of new variety development, which also may use genetic resources)[157]; and
- ABS/bioprospecting and genetic research.

Arguably, the policy purposes and international developments on these three issues are closely interlinked, even where national positions on each one are inconsistent. If they are re-linked, it may be possible to broaden ABS negotiations at all levels from the international regime negotiations to individual contracts. Countries may be able to link ABS compliance to other issues, such as streamlining permission to introduce LMOs and alien species within the country.[158] This linkage could extend further, enabling linkage between the user government's promotion and enforcement of ABS rights and the source country government's promotion and enforcement of laws controlling video piracy or other patent violations involving foreign companies' IPRs.

Based on these new discussions, it appears essential to revisit the question of whether international trade law has any impact on ABS. Although the above discussion does not alter the basic conclusion that 'ABS is not a trade issue,' it does suggest a need to explain trade rules more clearly in the ABS negotiation forum and to analyse whether international trade law could limit countries' sovereign right to decide who may acquire their resources. One way that the international ABS negotiations could ultimately become tied to trade issues might be to interlink it with open markets, commercial piracy and the avoidance of trade discrimination.

2.7.2 Antitrust and other controls

Antitrust law is a relatively recent addition to the law of commercial relationships. Although it takes somewhat different forms in each country, at least some elements of antitrust law have been adopted in most developed and many developing countries. The basic objective of antitrust law is relatively simple – balancing the needs of fair trade and commercial development. This suggests that antitrust law may have at least some potential lessons for ABS. One such important lesson is the extent to which the underlying legal mechanism and approach of antitrust law may be useful in development of the ABS regime. In this respect, it should be noted that antitrust law offers unique qualities that may be useful and necessary in ABS implementation.

For instance, many commentators have suggested that CITES and customs law, patent law, and environmental permit laws could be used to enable ABS implementation. It has been suggested that these existing legal systems could be used to implement ABS controls on transfers of genetic resources, by 'piggy-backing' additional ABS provisions and requirements on the agencies already responsible for implementing existing controls. Unfortunately, upon closer scrutiny, these proposals are seen to be impractical for many reasons. The agencies charged with these customs, patent and environmental permit systems are already overburdened with tasks that require the application of detailed and rigorous technical requirements (lists, standards, etc.) to a large number of companies or transactions.[159]

156 *See* Lettington and Dogley, 2006. This issue has been presented in early drafts of a book in this series (Cabrera and Lopez, 2007), but was withdrawn for further study, and will be analysed in a future publication.

157 *See* Young, 2006c, and citations therein.

158 The user who can prove that he engaged in benefit-sharing in the course of the development of a product, may obtain other permits or preferential position in the queue for product introduction.

159 Irene Sprotte 'The permit and certificate system of CITES' in European Regional Meeting on an Internationally Recognized Certificate of Origin / Source / Legal Provenance, 24-29 October, 2006.

In addition, the work of these agencies is usually sectorally funded, whether from the budget of a particular ministry or agency, or from application fees paid by a specific commercial sector. The only way to add more burdens to these agencies will be to take on the commitment to pay a large share of their funding.[160] Even then, most agencies would not welcome an arrangement which forces them to broaden their work to a cover a new sector and a very large number of transactions and inspections. Although an agency is already overseeing the same general group of regulated persons, the addition of a new set of regulatory standards would require significant additional administrative work, training and the development of rules and procedures on genetic resources that are relatively inflexible – specific and definite enough to enable a cadre of low-level inspectors and functionaries to apply them in this highly technical area.[161]

By contrast, antitrust law is directed at questions of *fairness and equity* across the entire commercial realm. It focuses on the impact of which companies or a commercial sector may have on the entire commercial market and on the social welfare of society. It recognizes the need to eliminate or control characteristics that are 'monopolistic' – i.e., conditions unfair to other persons or entities whether in the market, in the supply chain or otherwise dependent on an open and competitive market. Since it is not possible to define a specific set of characteristics, indicators and conditions that denote an antitrust violation, the antitrust agency normally has a very broad mandate to promote equity, by overseeing and investigating various types of commercial behavior. To accomplish this mandate, such agencies operate relatively flexibly, supplementing their formal role with informal mechanisms for the review of contracts and other business arrangements.[162]

The parallels between ABS and antitrust law are probably apparent from the foregoing description. Although it uses a commercial/trade-focused tool, ABS is intended to achieve an important social/environmental objective. Both ABS and antitrust share the goal of ensuring that trade and the protection of commerce does not cause harm to important social and governmental objectives, while recognising and protecting the needs and value of trade and commerce. This indicates that there may be some potential to develop a close relationship between the achievement of the objectives of antitrust laws and the achievement of ABS objectives. These similarities suggest that synergies or economies of scale may be found to justify linking ABS oversight to antitrust agencies. This issue should probably be examined in more detail.

160 Often, the agency or industry providing funding for a given agency normally also plays a critical role in determining the institution's priorities, staffing and responsibilities. This approach has been prevalent in patent agencies (usually funded by the fees paid by patent applicants) and agricultural ministries (sometimes funded by agriculture-oriented companies).

161 Young, 2004.

162 *See*, for example, the Japanese Fair Trade Agency, which provides informal review of some types of contracts to ensure that they are not violations of the act. (*See* Visser 't Hooft, 2002 at 99, discussing the role of informal review of a distributorship contract, as described in the case of *Kao v. Egawakikaku,* a part of the case of *Shiseido v. Fujikhonten,* 1474 *Hanrei Jihō*.

3 Contract Provisions and Experience

Tomme Rosanne Young

This chapter presents an experience-based view of ABS contracts. It's goals are to provide a variety of examples of special provisions used in ABS contracts to address the contractual aspects of key issues of genetic-resource access, use and benefit-sharing, and to provide some assistance (through comparative presentation of existing contracts, models and forms) for users and providers involved in the negotiation of particular ABS contracts. Each type of provision is generally introduced, in terms of its purpose and standard approaches to its function. The author then provides examples of this type of provision from actual contracts. The author does not, however legally analyze any of the contractual excerpts reproduced in this chapter. Many of the contracts examined are currently in force, and the author does not wish to prejudice any future decisions on them, nor is it useful to rate the impact of any contract without knowing the detailed facts about the parties. The needs of a contract are strongly affected by its objectives and expectations and especially the nature of the relationship between or among the parties.

In compiling the examples for this chapter, the author has reviewed more than 75 ABS-related contracts. This number was not a random selection from a larger 'universe' of instruments, however. It constitutes all of the contracts, models and forms that could be obtained by the author, or have been formally provided to the author, directly or through authorized research institutions (especially the WIPO database) over a period of approximately 15 years. Many of the parties and other sources who provided these examples asked that the specific parties, locations and other specific data should be kept confidential. To ensure that, this chapter complies with both the letter and the spirit of these requests, the author has removed all specific references to parties, resources, locations, and specific national laws. To this end, all of the contracts, except the SMTA, are referred to only by a 'contract number' which can be used to link provisions in one table to other provisions quoted in other tables.

In reprinting specific provisions, some limited changes were made in the text of the provisions themselves, primarily by removing extra details or repetitions that obscure the primary contractual issues, or made them more complicated to read and understand. Many of the provisions are still relatively complex.

Finally, several of the contracts were originally provided in languages other than English. They have been informally translated, to preserve anonymity.

Of the contracts reviewed,

- Thirty-seven were classic 'ABS contracts' – that is, contracts directly between (i) the user/collector and (ii) a source country or provider community/ agency/institution or person. Eight these specifically describe themselves stated as 'Material Transfer Agreements' – that is they focus on the physical collection and transfer of particular germplasm and payments for that material. The other 29 described the *res* of the contract in other terms indicating that information and other intangible properties and rights were being transferred

- Twenty-nine were 'downstream contracts' – that is, contracts between (i) one or more users or collectors who have already acquired genetic resources and (ii) with other researchers or developers seeking to undertake additional research and other genetic-resource utilization activities.

- Six were 'domestic' contracts – that is, the user/recipient acquired genetic resources from its own country and used them within that country (i.e., the user country and the source country were the same country).

- One was a seed multiplication contract, under which a farmer contracted to grow a seed crop for the developer of a new variety.

- One was a 'repatriation' contract, under which an ex-situ collection agrees to repatriate genetic resources to communities in the country of origin.

Obviously, it was not necessary or useful to reproduce every provision from all of these contracts. Many of them included provisions that were nearly identical, particularly where they are inter-related forms and models. Several variations were developed by one entity or organization, each designed to address a different type of ABS contract or a different stage in the genetic resources collection, analysis and development process. Many of other contracts, although created by different parties, utilize provisions that are relatively similar to one another. For some issues, only a few of the contracts chose to address the point or issue, whether because it was not relevant to the contract or because the parties could not agree on a provision, but felt that the contract would be valid and complete without addressing the point.

As a consequence, whenever a particular table includes only a few of examples, this small number may indicate one of three things. Either (i) most of the contracts reviewed have not addressed the point under discussion; or (ii) many of the contracts included such provisions, but their provisions were extremely similar to one another or (iii) the parties intentionally chose not to address the point in the contract, due to disagreement or for other reasons.

The tables in this chapter include examples from about 47 contracts, many of which were provided anonymously. To aid the reader in understanding the role and impact of each provision, the following chart provides basic information about each contract, specifying (i) the type of contract, (ii) the nature of its parties, and (iii) general subject matter addressed.

Table 3-1.2 Description of the contracts used in this book

Contract No.	Type	Status	Parties	Primary activities	Sector
1	ABS	C	1) UNIVERSITY (from Source Country) and 2) COMPANY a commercial user of genetic resources	Bioprospecting	Pharmaceutical
2	ABS	F	1) SUPPLIER (a 'provider' under national Law) 2) 'INTERESTED PARTY' a foreign user operating through PROJECT	Material transfer (from nature)	[Unspecified]
3	P	C	1) PRODUCER - a farmer and 2) PROPRETOR: An NGO holding rights in a new variety	Seed Multiplication	Agriculture
4	L, V	C	1) LICENSOR: developed country and 2) LICENSEE: commercial enterprise (same country.)	Variety Development	Agriculture
5	D	C	1) DATA-OWNER, a reesarcher using genetic resources; 2) DATABASE, a public institution which holds a database consisting of information and genetic material, 3) PARTNERSHIP (including dataowner and all other researchers contributing and researching on material from the database), and 4) (not directly parties but directly impacted by it) MEMBERS of Partnership, who are presumably all all bound by similar or identical contracts (depending on whether they have contributed material or are only using it).	Variety Research	Agriculture

Table 3-1.2 Description of the contracts used in this book (continued)

Contract No.	Type	Status	Parties	Primary activities	Sector
6	ABS	F	1) AGENCY - (an agency within a developing country) Provider of genetic material; and TECHNICAL OFFICE - a unit within AGENCY. 2) USER commercial or research	Bioprospecting	[Unspecified]
7	D	M	1) UNIVERSITY conducting sponsored research (specific provider, source or location of genetic resources not specified) and 2) SPONSOR: commercial entity funding research activities by UNIVERSITY	Research and Development (R&D)	[Unspecified]
8	D	M	1) UNIVERSITY conducting sponsored research (specific provider, source or location of genetic resources not specified) and 2) SPONSOR: commercial entity funding research activities by UNIVERSITY	R&D	[Unspecified]
9	D	M	1) UNIVERSITY conducting sponsored research (specific provider, source or location of genetic resources not specified) and 2) SPONSOR: commercial entity funding research activities by UNIVERSITY	R&D	[Unspecified]
10	D	M	1) UNIVERSITY conducting sponsored research (specific provider, source or location of genetic resources not specified) and 2) SPONSOR: commercial entity funding research activities by UNIVERSITY	R&D	[Unspecified]
11	D	M	1) UNIVERSITY conducting sponsored research (specific provider, source or location of genetic resources not specified) and 2) SPONSOR: commercial entity funding research activities by UNIVERSITY	R&D	[Unspecified]
12	ABS	F	1) PROVIDER organisation in a developing country; 2) RECIPIENT: collector or user: and 3) the lead SCIENTISTS of PROVIDER (signatory of the contract, but not listed as a party.) 4) lead scientist of RECIPIENT (signatory of the contract, but not bound as a party, nor signing on behalf of RECIPIENT.)	Bioprospecting	[Unspecified]
13	ABS	F	1) PROVIDER organisation; 2) RECIPIENT: collector or user: and 3) PROVIDER SCIENTIST: the lead SCIENTIST of the PROVIDER agency (The PROVIDER SCIENTIST is a signatory of the contract, but not listed as a party.) 4) RECIPIENT SCIENTIST: the lead SCIENTIST of the RECIPIENT organisation (The RECIPIENT SCIENTIST is a signatory of the contract, but not bound as a party, nor signing on behalf of RECIPIENT.) 5) TRADITIONAL COMMUNITIES and their representatives (third-party beneficiaries only (not signatories)	Bioprospecting	[Unspecified]
14	ABS	F	1) PROVIDER organisation in a developing country; 2) RECIPIENT: collector or user: and 3) the lead SCIENTISTS of PROVIDER (signatory of the contract, but not listed as a party.) 4) lead scientist of RECIPIENT (signatory of the contract, but not bound as a party, nor signing on behalf of RECIPIENT.)	Bioprospecting	[Unspecified]

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Table 3-1.2 Description of the contracts used in this book (continued)

Contract No.	Type	Status	Parties	Primary activities	Sector
15	ABS	F	1) PROVIDER organisation in a developing country; 2) RECIPIENT: collector or user: and 3) the lead SCIENTISTS of PROVIDER (signatory of the contract, but not listed as a party.) 4) lead scientist of RECIPIENT (signatory of the contract, but not bound as a party, nor signing on behalf of RECIPIENT.)	Bioprospecting	[Unspecified]
16	ABS	F	1) PROVIDER organisation in a developing country; 2) RECIPIENT: collector or user: and 3) the lead SCIENTISTS of PROVIDER (signatory of the contract, but not listed as a party.) 4) lead scientist of RECIPIENT (signatory of the contract, but not bound as a party, nor signing on behalf of RECIPIENT.)	Bioprospecting	[Unspecified]
17	ABS	F	1) PROVIDER organisation; 2) RECIPIENT: collector or user: and 3) the lead SCIENTISTS of PROVIDER (signatory of the contract, but not listed as a party.) 4) lead scientist of RECIPIENT (signatory of the contract, but not bound as a party, nor signing on behalf of RECIPIENT.) 5) TRADITIONAL COMMUNITIES and their representatives (third-party beneficiaries only (not signatories)	Bioprospecting	[Unspecified]
18	D	M	1) AGENCY (creater of the Model), holder of genetic resources whose acquisition is unclear or under a different contract 2) Rand D COMPANY, reviewing AGENCY's patent application, including relevant GR, for possible use or partnership	R&D	Pharma
19	D	M	1) AGENCY (creater of the Model), holder of genetic resources whose acquisition is unclear or under a different contract 2) Rand D COMPANY, a Research INSTITUTION	R&D (only quoted where different from Contract #18)	Pharma
20	D	M	1) AGENCY (creater of the Model), holder of genetic resources whose acquisition is unclear or under a different contract 2) Rand D COMPANY, a Research INSTITUTION	R&D (only quoted where different from Contract #18-19)	Pharma
21	D	M	1) AGENCY (creater of the Model), holder of genetic resources whose acquisition is unclear or under a different contract 2) Rand D COMPANY, a Research INSTITUTION	R&D (only quoted where different from Contract #18-20)	Pharma
22	D	M	1) AGENCY (creater of the Model), holder of genetic resources whose acquisition is unclear or under a different contract 2) LICENSEE Researcher	R&D	Pharma
23	D	M	1) AGENCY (creater of the Model), holder of genetic resources whose acquisition is unclear or under a different contract 2) LICENSEE Researcher	R&D (only quoted where different from Contract #22)	Pharma
24	D	M	1) AGENCY (creater of the Model), holder of genetic resources whose acquisition is unclear or under a different contract 2) LICENSEE Researcher	Patent licensing	Pharma
25	D	M	1) AGENCY (creater of the Model), holder of genetic resources whose acquisition is unclear or under a different contract 2) LICENSEE Researcher	Patent licensing (only quoted where different from Contract #24)	Pharma
26	D	M	1) AGENCY (creater of the Model), holder of genetic resources whose acquisition is unclear or under a different contract 2) LICENSEE Researcher	Patent licensing (only quoted where different from Contract #24-25)	Pharma

Table 3-1.2 Description of the contracts used in this book (continued)

Contract No.	Type	Status	Parties	Primary activities	Sector
27	D	M	1) AGENCY (creater of the Model), holder of genetic resources whose acquisition is unclear or under a different contract 2) LICENSEE Researcher	Patent licensing (only quoted where different from Contract #24-26)	Pharma
28	ABS	F	1) PROVIDER, a National Agricultural Collection; and 2) RECIPIENT of germplasm	Material transfer	Agriculture
29	REP	C	1) presumptive PROVIDER (a consortium of communities of origin) 2) International COLLECTION of germplasm and 3) NGO, a third-party named in the contract, related to the PROVIDER	'Repatriation' of genetic resources	Conservation
30	ABS	C	1) PROVIDER: A developed Country and 2) RECIPIENT collector/researcher from a different developed country	Bioprospecting / taxonomic research	[Unspecified]
31	ABS	C	1) PROVIDER: a developing country and AGENCY: a unit of government. 2) RECIPIENT, an agricultural-biological research entity	Bioprospecting / taxonomic research	Conservation
32	ABS	C	1) PROVIDER: A developing Country and 2) RECIPIENT collector/researcher	Bioprospecting and commercial research	Agriculture
33	ABS	C	1) PROVIDER a private university in a developing country, collector/bioprospector of the genetic resource; 2) RECIPIENT, a public university from a developed country serving as intermediary between PROVIDER and COMPANY, but also with a right to retain and conduct research on reference samples transferred to COMPANY; 3) COMPANY, a commercial company (a third-party beneficiary of the contract), receiving samples from RECIPIENT for commercial research. 4) INSTITUTE: A user-country government research institute, which formally assumes some duties, and as a result may be a third party beneficiary (see _____); 5) Other named research institutions 'may receive' additional copies of collected samples, but are not third party beneficiaries; 6) The 'granting agency' which funds RECIPIENT's activities.	Bioprospecting and commercial research	Enables discovery of 'any medicinal, pharmaceutical, agrichemical or otherwise useful compound'
34	D	C	1) TRANSFEROR, a university which is recipient of genetic resources under a separate contract with a source-coutry-based provider; 2) SCIENTIFIC INSTITUTE a (user-country) government pharmaceutical research institution; 3) The specific PRINCIPAL RESEARCHER of SCIENTIFIC INSTITUTE is named in the Agreement but does not sign as a party. 4) Other non-parties (including the original provider) are mentioned and in some cases given specific rights or duties under this agreement, but not specifically indentified as ,third party beneficiaries' (as discussed in ___).	Bioprospecting and commercial research	Pharma
35	D	C	1) TRANSFEROR, a university which is recipient of genetic resources under a separate contract with a source-coutry-based provider; 2) DEVELOPING COMPANY, a private commercial company; 3 and etc.) other companies, research institutes and universities are mentioned in the Agreeent, but not specifically given direct rights/duties, or identified as third-party beneficiaries.	R&D	Pharma and Agrichemical

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Table 3-1.2 Description of the contracts used in this book (continued)

Contract No.	Type	Status	Parties	Primary activities	Sector
36	ABS	C	1) PROVIDER a public university in a developing country, collector/bioprospector of the GR; 2) RECIPIENT, a public university in a developed country acting as intermediary between PROVIDER and COMPANY, and receiving the right to retain and conduct research on reference samples of material transferred to COMPANY; 3) COMPANY, a commercial company, as third party beneficiary of the contract, receiving samples from RECIPIENT for commercial research. 4) A (user-country) government research institute – is mentioned, but it is not clear whether it is a third party beneficiary 5) Other research institutions are named and 'may receive' additional copies of collected samples, (not 'third party beneficiaries'.) D116) The 'granting agency' which funds RECIPIENT's activities is named, but this may be another way of refering to the COMPANY. 6) The 'GRANTING AGENCY' which funds RECIPIENT's activities.	Bioprospecting and commercial research	Enables discovery of 'any medicinal, pharmaceutical, agrichemical or otherwise useful compound'
37	D	C	1) TRANSFEROR, a university which is recipient of genetic resources under a separate contract with a source-coutry-based provider; 2) TRANSFEREE UNIVERSITY a research foundation attached to a private unifersity in the same (user) country as TRANSFEROR.. 3) The PRINCIPAL RESEARCHER of TRANSFEREE UNIVERSITY is specified in the Agreement but not a party to it. 4 and etc) Other non-parties (including the original provider) are mentioned and in some cases given specific rights or duties under this agreement, but not specifically indentified as ,third party beneficiaries' of the agreement.	Research and Development	Pharma
38	ABS	C	1) PROVIDER a public research organisation in a developing country, collector/bioprospector of the genetic resource; 2) RECIPIENT, a developed country university acting as intermediary between PROVIDER and COMPANY, allowed to retain samples and conduct research; 3) COMPANY, a commercial company is a third party beneficiary, receiving samples from RECIPIENT. 4) A (user-country) government research institute – is mentioned, but may not be a third party beneficiary 5 and etc.) Other research institutions 'may receive' additional copies of samples, but are not 'third party beneficiaries'. 6) 'GRANTING AGENCY' (may be another way of referring to COMPANY)	Bioprospecting and commercial research	Enables discovery of 'any medicinal, pharmaceutical, agrichemical or otherwise useful compound'

Table 3-1.2 Description of the contracts used in this book (continued)

Contract No.	Type	Status	Parties	Primary activities	Sector
39	ABS/D	C	1) PROVIDER, a developing country agency; 2) UNIVERSITY, a developed country university engaged in bioprospecting research; 3) FOUNDATION, a private foundation related to UNIVERSITY; and 4) COMPANY, a commercial company involved in pharmaceutical Rand D. 5) PROJECT, a (developed-country) government institute bioprospecting project, named but not specifically identified as a third-party beneficiary of this project. [NOTE: Some provisions suggest that this Agreement creates a partnership among the above-listed parties.]	Bioprospecting and commercial research	Pharma
40	ABS	C	1) PROVIDER, a developing country research program; 2) RECIPIENT, a government research/collection institution in a developing country; 3) INSTITUTE, a second government research institute located in the same developed country, working under funds from SPONSORING PROJECT. 4) SPONSORING PROJECT, a user-country technical assistance / bioprospecting program, named but not a signatory.	Bioprospecting and commercial research	Pharma
41	ABS	C	1) PROVIDER, a developing country government agency; 2) UNIVERSITY, a private university in a developed country engaged in bioprospecting research; 3) FOUNDATION, a private foundation related to UNIVERSITY; and 4) COMPANY, a commercial company involved in pharmaceutical research and development. 5) PROJECT a developed-country government institute's bioprospecting-promoting project, named, but not specifically identified as a third-party beneficiary. [NOTE: Some language suggests that the Agreement creates a legal partnership among the above-listed parties.]	Bioprospecting and commercial research	Pharma
42	ABS	C	1) PROVIDER, a developing country research program; 2) RECIPIENT, a government research/collection institution in a developing country; 3) INSTITUTE, a second government research institute located in the same developed country, working under funds from SPONSORING PROJECT. 4) SPONSORING PROJECT, a user-country technical assistance / bioprospecting program, named but not a signatory.	Bioprospecting and commercial research	Pharma
43	ABS	C	1) PROVIDER-COUNTRY INSTITUTION (research institute) 2) PROVIDER-COUNTRY INSTITUTION (research institute) 3) NATIONAL PARKS from developing countries; 4) UNIVERSITY, in a developed country; 5) COMPANY, engaged in Rand D, and 6) SPONSORING AGENCY from a developed country.	Bioprospecting and commercial research	Agriculture
44	ABS	C	1) PROVIDER, an developing country agency; 2) RECIPIENT, a developed country research institute; 3) SUPPORTING PROJECT, a developed country project (and agency), referenced in this Agreement, but not specifically a party.	Bioprospecting and commercial research	Pharma

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Table 3-1.2 Description of the contracts used in this book (continued)

Contract No.	Type	Status	Parties	Primary activities	Sector
45	D	C	1) INSTITUTE, a developed country research institute; 2) COMPANY, a developed country Rand D company.	R&D	Unspecified
46	ABS, L	F	1) ACCESS PROVIDER - Private person or entity contracting to provide genetic resources 2) ACCESS PARTY - Private person or entity seeking to obtain and use genetic resources	Collection of biological samples and use of their genetic resources	Unspecified
47	ABS, L	F	1) CENTRAL GOVERNMENT of source country, acting through DEPARTMENT 2) ACCESS PARTY - Private person or entity seeking to obtain and use genetic resources	Collection of biological samples and use of their genetic resources (only quoted where different from Contract #46)	Unspecified
SMTA		F	1) PROVIDER (agricultural collection) and 2) RECIPIENT, a user of agricultural genetic resources for agricultural purposes.	Material transfer	Agriculture

Types:

ABS = Access and Benefit-sharing contract between a source country* and a user or researcher

D = Downstream Contract

P = Contract for on-farm seed production or multiplication

RE = Repatriation of genetic resources held in *ex-situ* collections

V = Variety development (source country hiring company to develop a variety from specific genetic resources within its sovereign ownership

L = Local/Domestic Contract (provider and user both from the same country, which is the country in which all contract activities will occur.)

* nearly all of the ABS contracts between commercial users and communities that were reviewed for this book were subject to restrictions that prevented their publication or quotation The author has included general lessons from those contracts in text discussions in Chapters 2 and 3.

Status

C = Contract in Force

F = Form

M = Model

The decision to include a contract in this book was based on the potential lessons that might be learned by examination of its terms. The contract list includes many kinds of instruments that are only distantly related to the original ABS transaction – that is, the agreement by which the user obtained access to genetic resources from the original provider (i.e., person, community or country through whom the resources were originally taken from their *in-situ* source) and/or agreed to share benefits arising from the use of genetic resources.

By including these provisions, the author does not intend to recommend any of them as being 'good', 'effective' or even 'necessary' in all ABS situations. Similarly, this chapter does not offer any specific advice regarding the use of any or all of these instruments. The negotiation of contracts is a complex and multifaceted process – similar to prescribing medicine or surgery to address or prevent an illness or condition. The use of contractual approaches depend on the 'diagnosis' of the needs, issues, conditions, nature and attitudes of the parties and the *res* – factors which are different from contract to contract. Any provision, model, form or guidance document, while very useful and effective in one set of circumstances, can be a disaster if applied to a different situation.

For this reason, before presenting the excerpted provisions, this chapter opens with a discussion about the best practices in using examples, forms and models. Many of these points may be self-evident, but are thought to be worth repeating.

3.1 Examples, models and forms

The provisions reproduced in the following sections, are taken from three types of instruments: contracts in force; form contracts; and model contracts. As tools for negotiating and drafting a new contract, each type has both strengths and limitations:

Contracts in force: Existing contracts are normally the products of a negotiation process, reflecting compromises between the parties as compared with their various starting positions. In addition, each one has been amended to conform to the law of the source and user countries, as well as any other applicable law and local concerns. Normally, each negotiator should begin from his own starting position, rather than from a compromise position that concluded some other negotiation. Before using an existing contract as a 'template' for a new contract, it may be very useful to investigate the negotiations of such a contract, and obtain information about the parties' objectives and strategies, even when the same parties are negotiating the new contract.

Form contracts: For this book, 'form' refers to a formally developed instrument that has been adopted by a country, company or other body that has made a firm legal commitment to use the form, in its ABS transactions. Some forms are 'unchangeable' – where the adopting party requires that it must be used 'as-is.'[1] Other forms specifically identify particular provisions or points that may be individualized and negotiated, but mandate that others must be included in all contracts.[2]

Because the adopting entity commits to using the form, the creation of a new form is usually carefully vetted by experienced contract negotiators, lawyers and administrators prior to adoption, to make sure that it is well written and legally protective of that party's interests, including its interest in fair dealing with the other party. Governmentally adopted forms are often developed in public processes and may be more attentive to the interests of other parties.[3]

Model contracts: Models are essentially 'hypothetical contracts.' Models are often written or promoted by academics or by industry associations or other bodies which will not actually become parties to the contracts themselves. Given that no party or entity commits itself to their use, models' development processes are often unilateral or based on limited input from other sectors. While models sometimes offer innovative solutions to contractual development challenges, their primary value is that they provide insight into the objectives or perspective of the sector or entity proposing the model.

Forms and models are most effective when they are (i) focused very narrowly on a specific type of situation between very specific categories of parties; and (ii) negotiated in a process that reflects the interests of all stakeholders that would otherwise negotiate an individual instrument.

In conventional contract law, forms and models are frequently used in many commercial sectors. They serve a variety of purposes that simplify and streamline contract negotiations, drafting and formalities, operating to

1 The most explicit example of this approach is the SMTA, which insists that no changes may be made in the use of the form. The parties may only fill in the blanks (name, institution, resources changing hands, etc.) *See* discussion in 1.4.

2 An excellent example of this approach is found in the form instrument adopted in Costa Rica, which allows variability in special provisions:

> *The Agreement can contain additional dispositions [not included in the form itself] on the following aspects: a. Guarantee by supplier regarding the identity and/or quality of the material provided. b. Definitions. c. Obligation to minimize the environmental impacts of harvesting activities. d. Events that limit civil responsibility of either party to the other (*e.g.*, natural catastrophes, fires, floods, etc.). e. Confidentiality clauses. f. Other guarantee. g. Other clauses, as permitted under the law [of the country adopting this form]*

The Parties are allowed to adopt other clauses that they consider advisable, but the form identifies a large selection of specific matters whose content must be addressed, and must comply with legislative schedules and requirements. These include specifically, the provisions for 'Payment of Administrative Costs and other Expenses', 'Final Results' (focused on the sharing of research results and crediting the source in publications) 'Respect for Traditional Knowledge' and 'Verification and Control'.

3 Form contracts must that their form may be, take special measure to ensure that they are not considered 'contract of adhesion', as described in 2.4.1.4 and elsewhere.

- eliminate guesswork and put all parties on an equal footing;

- give confidence to sectoral participants or officials with little commercial experience with contracts, by providing a step-by-step, fill-in-the-blanks guide to the completion of the transaction;

- provide an easy way for negotiators to sidestep difficult legal questions that may arise (by prohibiting alterations to the model, it is expected that new legal conundrums will not arise);

- standardize expectations, eliminating the worry of negotiators who fear that they will make a legal or technical mistake that results in a loss of funds, legal rights, or negotiating position for their institution;

- eliminate the need to obtain high-level official approval of each individual contract;

- allow commercial users to entrust negotiations to lower-level functionaries who do not have detailed legal or contractual expertise (rather than being forced to use senior decision-makers and legal advisors for every contract); and

- ensure that each contract is well written (clear and enforceable legal language) even if negotiated and signed by non-legal experts.

Each contractual situation is different, however. Academic and industry-sponsored models can achieve the above objectives only if they are very narrow in subject and are developed on the basis on exhaustive study of relevant law (in all countries in which the instrument is to be used). In many countries, legal disputes over agreements based on 'model contracts' are plentiful.

In general, forms and models have been most successful in legal areas that have developed over a long time. For example, the law governing the ownership and transfer or lands and buildings has evolved over many centuries; the particular issues and formalities of this type of transaction are well understood. Consequently, in many countries, a variety of forms and models (e.g., sale contracts, leases, mortgages) are a primary tool of commercial practice. Where the law is unclear, the drafter of a model has no special insight. His model may be useful as a set of ideas, but nothing more.

Many ABS models and standard forms have been created by a variety of industry groups and other advisors. ABS negotiators have sometimes recommended creating mandatory forms which shall apply to all ABS agreements. It is easy to understand why this idea is so appealing. The goal of streamlining the ABS process arises from the presumption that the delay in consummating ABS contracts is usually caused by the difficulty of negotiations. The general belief is that companies, governments and others need longer deliberations and more time for evaluating each particular contract where the terms of that instrument are unique. They assume that the negotiations will be completed more quickly, if there are fewer available contract options to choose from.

Moreover, by adopting one or more standard formats, the regime would make the task of the person signing the contract (agency official, community representative or company representative) very simple: All that person would have to do is confirm that the correct form is used, and that the form has been correctly filled out. In that case, responsibility for negotiating ABS arrangements could be given to lower-level functionaries, who would not need to obtain permission or approval from the legal division or central government, prior to signing the contract. Based on these assumptions and presumptions, the negotiators have not yet fully examined the idea of a 'standard ABS contract,' nor identified the institutional factors necessary in order for a model or form to be used and useful.

In ABS, the most important discussions of the use of forms and models are found in the SMTA and the Bonn Guidelines. As discussed in 1.4, the SMTA is the best known form in the ABS system. Provisions from the SMTA are included in the Tables in this chapter, and offer a useful comparison to the contract provisions used in other sectors. Several of the Bonn Guidelines suggest or recommend that form/model contracts[4] are a potentially useful tool. They have taken a 'mix and match' ap-

4 Bonn Guidelines § 42.d, suggesting the '[d]evelopment of different contractual arrangements for different resources and for different uses and development of model agreements'.

proach, suggesting the creation of a checklist of 'model provisions' to address various challenges in contract negotiations.[5] These initial ideas constitute general suggestions about how ABS contracts should be documented, executed, overseen and if necessary enforced.[6]

The creation of ABS forms has been raised as an important option in the international regime negotiations. The Parties have noted that there are many different types of ABS contracts, and that they would face virtually insurmountable challenges in attempting to create a single form. It would be difficult indeed to find a single unified form/model for ABS, that would be satisfy to all types of users (academic researchers, botanical gardens and conservation biologists and commercial R&D divisions) as well as providers.

As a consequence, many ABS discussions have focused on the development of a series of forms or form provisions. The success of the SMTA provides a useful lesson on this point. It is very narrow in coverage and focus (limited to PGR transfer between collections and agricultural variety developers) and was based on a long history of pre-SMTA transactions that were also narrowly focused.[7] The SMTA thus adopted provisions that were already well accepted within that subsector. Some of these would be highly controversial in other ABS sectors. It does support the view that, if well researched, carefully drafted and properly used, the adoption of various forms can resolve many of the contractual challenges encountered in ABS.

3.1.1 Using contracts as examples

An existing contract's usefulness as an example or template for a new contract depends on situational factors – specifically, on whether a particular existing contract is similar to the contract that is being negotiated. The negotiators should compare their own situation to the proposed contract by looking at three contractual factors:

- The nature and specific interests of the user and provider;
- The specific activities and rights granted under the contract; and
- The commercial sector involved.

Knowledge of these factors will help the negotiator understand where and why the example contract is relevant, and where it is not, based on awareness of the differences between the exemplar and the current transaction.

3.1.1.1 Nature of the parties

The differences between various groups are not always readily obvious. Some kinds of users (government research agencies and other non-commercial users) place a high priority on transparency, and make a point of publishing their contracts. These organizations usually have multiple social (i.e., non-commercial) objectives, such as

- improving livelihoods in less-developed countries or communities;
- promoting development of those countries or communities; and

5 The Bonn Guidelines provide three lists of possible terms that could be included in model provisions at § 43 ('guiding parameters' of MAT), § 44 ('indicative list of typical mutually agreed terms'); and § 45 (MAT on benefit-sharing).

6 *Documentation of compliance:* 'Parties should endeavor to establish mechanisms to promote accountability … in access and benefit-sharing arrangements… [and] may consider establishing requirements regarding: a. reporting; and b. disclosure of information.' Bonn Guidelines §§ 52-3. 'The individual collector or institution on whose behalf the collector is operating should, where appropriate, be responsible and accountable for the compliance of the collector.' Id. § 54.

Remedies: 'Parties may take appropriate effective and proportionate measures for violations of national legislative, administrative or policy measures implementing the ABS provisions of the CBD.' Bonn Guidelines § 61.

Verification: 'Voluntary verification mechanisms could be developed at the national level to ensure compliance with the ABS provisions of the CBD and national legal instruments of the country of origin.' In addition, it states that 'a system of voluntary certification could serve as a means to verify the transparency of the process of ABS [including]… that the ABS provisions of the CBD have been complied with. Bonn Guidelines §§ 57-8.

7 Formerly, the CGIAR provided a database of transactions showing that virtually all countries use genetic resources from the international agricultural collections. It documented tens of thousands of such transactions per year. A primary objective behind creation of the ITPGRFA was the goal of ensuring that this vital exchange of resources – a critical element in the development of new varieties and promotion of food security – would not be obstructed by the imposition of the ABS process. Fowler *et al.*, 2001.

- genetically identifying species and varieties with pharmaceutically important properties and making them available to a broad range of potential users for the benefit of all people.

As such, these contracts often include provisions that might not be acceptable in negotiations with commercial users or for commercial purposes.

By contrast, commercial entities often do not make copies of their existing contracts available.[8] Commercial entities do not place the same value on transparency of their contracts. In addition, they do not normally give commercial priority to the first two objectives listed above. This is entirely understandable, since a company or commercial venture has a very different mandate. One cannot measure a commercial user by the same yardstick that is used to measure the performance of aid agencies, research agencies, collections or NGOs. For the provider this difference demonstrates the value of all types of contracts. The benefits that a commercial entity may be able to obtain through use of genetic resources, and share under an ABS agreement may be quite different in many ways from those of the non-commercial entity.

Even within the two groups, individual entities have differing overall mandates that may affect the contents of their ABS contracts. Aid agencies, non-commercial researchers and public scientific/research institutions, exemplify a great many different objectives. For example, an agency whose objective is foreign aid may focus more attention on helping the provider community or country to develop its own research capacity and/or ability to develop the results of that research. By contrast, the first objective of a user country's national health agency is the promotion of its own R&D capability, with a secondary desire to achieve social purposes in the provider country. Research agencies and academic institutions may have both individual interests (to ensure that they may later publish or sell their discoveries without limit) and global scientific objectives (to ensure that other researchers, conservation experts and governments have access to information), which are paramount over any particular interest in social welfare or livelihoods within the particular provider country or community. In each case, the user will normally be very sympathetic to the needs of the provider, but will perceive its obligations and trade-offs as a user very differently.

Among commercial entities, differences may be similarly significant. An ABS contract with a commercial entity will normally be much stricter and legally rigorous, but it may be much more desirable to the provider. Benefit-shares under such a contract are potentially more valuable (monetarily, in the nature of information received, and in the development of longer-term commercial relationships) than the benefits under an ABS contract with a non-commercial researcher, agency or NGO.

Although less frequently discussed, there are similar differences on the provider/source side, as well, usually based on the 'level' of the entity acting as provider – that is, whether the 'provider' side of the contract is negotiated by the (i) central government, (ii) some agency or institution within the government, (iii) a local community, or (iv) an individual.

In many ABS discussions, it is assumed that the source-country's government will conduct or oversee all ABS negotiations. Other negotiators assume that the local or indigenous community will control this process. Neither of these assumptions is applicable in all countries, however. In some countries, the authority to negotiate as 'provider' of the country's genetic resources is a duty of the central government. Several others delegate rights and responsibilities of the provider to specific agencies, ministries or to individual protected areas, which operate as separate 'providers'. Delegation of authority may be made by statute in some countries, or determined on a case-by-case basis, in others. Other countries delegate 'provider' authority to individuals and communities – usually those who own or control the land on which specimen-collection activities occur. Most existing ABS laws embody a combination of these approaches, with separate approvals needed from various agencies, individuals and communities.

8 In seeking contracts for this book, for example, a number of commercial ABS contracts were obtained, under the specific restriction that they must be kept confidential. Often, this is a requirement of the contract. A few such contracts were obtained without restriction, usually from sources other than the parties to that instrument. Contracts between large commercial entities and providers are nearly always subject to restrictions that make it impossible to reproduce their provisions in this book.

For contractual purposes it is important to note that the objectives of the various levels of providers are dramatically different, depending on which approach the country has chosen:

- *Central government level:* Normally, when negotiations are lead by the national level, the ultimate contract will have a broader view, placing a greater emphasis on benefits applicable to the entire country and its citizenry. Benefits that are focused too narrowly on a single individual or community may overlook the country's sovereign duty to all of its citizens (to ensure proper use of the country's resources and proper benefits to the country). Benefits that increase national capacity, provide new industrial or technical opportunities and/or employ local citizens are often perceived as national in scope.

- *Individual/community level:* Where the provider is an individual landowner or small community, by contrast, negotiations are normally focused on the narrowest view of the term 'benefit' – specific value transfers to that particular individual or group.

- *Designated agency, ministry or institution:* Where a particular government agency or other government-related entity (research institute or university) is deemed 'the provider,' the result is consistently between the two prior options. Sectoral or institutional negotiators may focus on benefits to their own sector or institution, but they will often perceive these benefits in terms of the institution's mandate, which is designed to provide long-term value to the country. Thus, where the provider is an academic or research institution, it will often value 'national benefits' in the form of training, scholarships, equipment and other in-kind benefits,[9] provided through the academic institution. It will also place high priority on negotiation of research rights, rights to publicize research results, and other access to information.

None of these options is per se either negative or positive. In each country, the decision to centralize the negotiations or to devolve those rights to other levels may reflect a particular national strategy, indicating that ABS has been integrated into a larger national framework (such as the national strategy for conservation, for rural development, for agriculture, etc.) The specific terms of a contract (as discussed in part 3.2 of this chapter) may be quite different depending on the nature of the provider and the role of ABS in the source country's national policy framework. Equally, the nature and objective of the user will lead to other kinds of variations.

3.1.1.2 Specific activities and rights granted

Another factor affecting the similarity between an example contract and the current negotiations is the scope or inclusiveness of activities and rights addressed in the example contract. In general, the primary differences in 'scope or inclusiveness' can be seen by dividing ABS contracts into two categories: (a) contracts for 'taxonomic' activities – e.g., collecting, identifying, labeling and preserving/conserving samples; or (b) contracts for research and development (which may be either 'commercial' or 'noncommercial'). While it is possible that some ABS contracts will have other objectives, these two categories appear to encompass nearly all ABS contracts. Category (a) will primarily involve noncommercial users; however, taxonomic collections and collected material developed through these contracts may be transferred to commercial R&D departments and other researchers who may use the material for commercial purposes. Category (b) will include most commercial contracts, but may also include noncommercial contracts involving activities that could lead to commercial uses.

Normally, taxonomic contracts will be broader in biological scope, including a wider range of specimens and species than R&D/analysis contracts. In addition, the taxonomy contracts will normally grant the parties broader powers and greater flexibility to choose which specimens to collect or analyze. Contracts aimed at broadening taxonomic knowledge normally focus on four components –

(i) enabling the broadest possible sampling and preservation;

(ii) ensuring that the user shares the samples and information collected with the provider;

9 In most countries, equipment, facilities, training and other in-kind benefits may be retained by the sectoral agency. In many countries, however, payments of money (a share in proceeds from resource use) must be paid into central government accounts, which may be earmarked for special distribution, in some countries. (*See* Table 3.2.4.2d.)

(iii) developing a framework through which provider citizens and companies participate and provide assistance in the user's task; and

(iv) discussing the parties' rights in case an opportunity arises for commercial development of the genetic resources (i.e., whether separate permission from the provider or source country is required, and whether any information or research results may be published).

By contrast, where the purpose of the contract is specimen analysis for commercial or noncommercial use and development, the situation may be reversed. Components i and ii (scope and sharing obligations) are often stated very narrowly. Commercial analysis and R&D contracts are often very specific about which genetic resources are granted and to whom. At the same time, component iv (rights granted) may be much more expansive regarding what may be done with the specimens that are obtained or used. The user is often granted a wide latitude to develop products, so long as benefit-sharing will result. In such contracts, the provider may expect or presume a different type or higher levels of benefit-sharing.

3.1.1.3 Sectoral focus

Finally, the difference among sectors is also important in deciding whether a particular contract, form or model is a relevant or useful guide to your own contractual drafting and negotiations. Often, the sectors differ greatly in the way that provisions are phrased, in the performances that are required, in the contract's picture of the 'benefit' that will arise and in the type and manner of benefit-sharing to be applied.[10]

Contracts regarding the genetic-resource activities in the pharmaceutical industry, for example, frequently involve highly technical modes of examination and utilization of complex molecules and sequences of a single variety. Difficulties of reproduction, multiplication and/or synthesis of these resources often make the need for re-supply from the wild of a species a prime concern. As a consequence, contracts in this sector are generally believed to operate quite differently from agricultural use of genetic resources, and potentially require that ABS contracts address different points of concern.

3.2 Contract provisions

The following discussions and examples do not cover all contract provisions found in ABS contracts. They examine (i) special provisions developed to address ABS issues (such as 'access' to genetic resources, identification and tracking of resources and their use, and 'benefit-sharing'); or (ii) conventional provisions that may give rise to less conventional concerns when applied to ABS contracts.

The idea behind this chapter is only to reflect a variety of different types of approaches and issues of concern in addressing several issues, rather than to analyze or recommend these provisions. Many aspects of ABS law are still unclear – some are being negotiated as part of the international regime, and most legal issues have not yet been examined by courts or national legislatures. It is not appropriate at this point to comment in detail on instruments in force. Once the basic ABS framework has been clarified by the international regime and national implementing law, it will be possible to more effectively apply national contract and property law to various ABS issues. In the meantime, the following sections provide examples of current ABS contracts and their reflection of the way companies are seeking contractual certainty, to deal with the uncertainties of the current legal climate.

10 For example, commercial needs in agricultural breeding contracts reportedly differ markedly between the plant sector and the animals sector. The development of a new plant variety amalgamates dozens or hundreds of crosses. These practices are much more inclusive than other commercial uses of genetic resources or biochemical properties of wild or traditionally derived species. This has been one justification given for the creation of the ITPGRFA – the impossibility of tracking all genetic contributors to each new variety. Lesser, 1992. Fowler *et al.*, 2001. By contrast, animal-breeding has been a subject of contracts and legal rights for many centuries. For more than two millennia, the law has recognized the legal authority of the owner of one animal to grant rights in that animal's inherited characteristics, through traditional and legal practices for animal breeding. Animal breeding records date back many centuries, and have been formally recognized and enforced by courts and other governmental processes. *See*, Hiemstra *et al.*, 2006 and Tvedt *et al.*, 2007. And *see*, e.g., Bennet, D., 2004, 'The Origin and Relationships of the Mustang, Barb, and Arabian Horse' The Spanish Mustang, introduction.; and Lewis, B. 'Egyptian Arabians, The Mystique Unfolded' in Arabian Horses of the Pyramids (http://www.pyramidarabians.com/news/articles/arabianmystique.html), both of which document evidence of controlled animal pedigrees dating back more than 2 millennia, and formal written records as early as 1300 AD.

In generating the Tables in this chapter, the author has attempted to tread a balance between being complete and being repetitive. No contract reviewed for this book (whether quoted here or not) addresses all points described in this Chapter. For example, many of the contracts do not contain definitions, scope provisions, nor any discussion of intellectual property rights. Many of them do not discuss or specify legal rights in genetic resources. Very few of them discuss compliance with national ABS legislation nor benefit-sharing.

On the other hand, there was a high level of repetition as to some provisions. On some issues, several contracts have used the identical provision. Where provisions in two or more contracts are nearly identical, only one characteristic example is included: slight changes among the provisions are not reproduced unless the wording difference would affect the rights of one of the parties.

Many clauses illustrate more than one point, and may be repeated in more than one table.

In some places, the Bonn Guidelines have been cited in this chapter; however, the chapter does not restate the Guidelines' provisions. Parties negotiating an ABS contract would be well advised to separately examine the Bonn Guidelines, as well as other instruments such as the Japanese Guidelines on ABS – a soft-law document developed by an industry-government cooperation and strongly supported by the Japanese government[11] – and Costa Rica's new Code of Conduct on Access to Genetic and Biochemical Resources and Elements of Biodiversity.[12]

3.2.1 Identifying and binding the parties to an ABS contract

One basic purpose of a written contract is to identify the contract parties and the title of the specific individuals involved in the negotiations. Normally, at a minimum, the contract will name the parties in opening provisions. In other cases, identification provisions can serve additional purposes. The most important roles served by these provisions raise particular concerns in ABS contracts, including the following:

- *Legal authority*. Each party to the negotiations needs assurance that the others are fully authorized by the organization, agency, government or other party that they claim to represent – i.e., that they have a legal right to make commitments on behalf of that organisation.[13]

- *Ability to act on behalf of the entity*. When one person is going to sign the agreement as the representative of an entity, the others need assurance that the persons signing has the legal ability to bind that entity.[14]

In ABS, both user and provider have to consider the authority of the other negotiator or signatory. Where a person claims to be the 'owner' of genetic resources, the other parties need to know that this is true, and that no other person or entity will later claim to own those resources. Where the government holds primary rights to genetic resources, the user needs to be certain that the person signing has governmental authority to grant access to those resources. In some cases, an agency or institution has signed an ABS contract, but the contract was later invalidated by the country which noted that that agency or institution did not have the right to the genetic resources.[15]

From the provider's perspective, it is often true that an individual researcher or other person is the user's primary contact with the provider country. If that person negotiates or signs the ABS Contract with regard to his own actions, the ultimate user may not be bound by the contract. In addition, confirmation of the identity and authority of the parties may be required under other na-

11 JAPAN: METI/KBA. 2006. Guidelines for Access to Genetic Resources for Users in Japan, Ministry of Economy, Trade & Industry (adopted March 2005, (published in English, 2006)). *See* http://www.mabs.jp/information/oshirase/pdf/iden_tebiki_e.pdf.

12 *Código de conducta para el acceso a elementos y recursos genéticos y bioquímicos de la biodiversidad,* Ministro del Ambiente y Energía, 18 April 2007.

13 In normal commercial contracts, authority questions arise in many ways. For example, an individual handing negotiations on behalf of a company, agency, government, etc. must prove that he has been authorised to make commitments on behalf of that company, agency, government or community. If not, the contract may not be binding on that entity.

14 As noted in 2.3.1.2, legal capacity arises in many ways. Another relevant issue is the duty to provide information, sometimes called the requirement of 'fair disclosure' of essential facts relevant to the contract. This duty is complicated. Parties are not required to disclose their negotiating strategies or other internal matters. Often, the difference between 'internal matters' and 'essential facts' is unclear.

15 Laird and Lisinge, 1998.

tional law, such as those designed to protect against commercial deceit and misrepresentation. Other elements of the provisions identifying the Parties would consider the following:

- *Financial ability to perform.* Where one party has a duty to pay money or take other actions, the others need assurance that this party has the legal and financial ability to meet these obligations. The need for this assurance is simply explained. The courts and national law can only provide redress if the parties are sufficiently solvent. If a party does not have sufficient financial and other resources to meet his obligations, then it does not matter what court order or other legal decision is made – there is no legal way to force him to pay money or other value that he does not have. In ABS, this element is usually more important where the contract calls for long-term actions and/or benefits in money or in-kind.

- *Third-party beneficiaries.* Where third parties might have some interest in the contract, all parties need to identify these and be clear about which are 'intended third-party beneficiaries' (see 2.4.4.3) under the contract.

Fewer than half of the contracts reviewed for this book include any of these types of provisions. The following discussions and tables provide examples of the primary approaches used in ABS Contracts relevant to some of these issues.

3.2.1.1 Ownership/rights in genetic resources

In ABS contracts, the 'ownership' (or the legal right to grant access to) the genetic resources[16] can be complicated by several factors. Most countries have not adopted specific laws stating how genetic resources are governed or what category of property law (discussed in 1.1.1) shall apply to them. As a consequence, in nearly all countries there is no external way to determine who has the legal right to own or dispose of those resources. The only way to address this uncertainty is by obtaining a final decision from the government or courts – a process that can be both long and costly. In addition, most species are dispersed very widely. Many different persons, entities or communities may have rights in the same subspecies or variety. Consider, for example, a contract which grants a user the exclusive right to collect or utilize the genetic resources of a particular variety, or the right to obtain such exclusivity by filing an IPR. In that case, principles of equity or legal fairness may apply under which other persons who hold rights in that same variety's genetic resources would have rights under the contract or rights to invalidate it. In many countries, benefit-sharing rights are still controversial, so that challenges of this type may arise in unexpected ways.[17]

If a party's claim of authority to grant access to genetic resources is untrue or overturned, the other party's only legal right will be to seek redress from the first party. He cannot obtain a clear legal right to the resources, nor any protection against legal action by other persons, without seeking a new contract with the true owner or rightholder. This result does not change if the first party has formally stated in the contract that he is authorized. Consequently, in any contract, it is recommended that the parties take steps to confirm legal authority from official sources or require that the provider obtain such formal documentation.[18] As noted above, this issue of legal authority has previously arisen in many ABS situations.

Table 3.2.1.1 provides some examples of the manner in which ABS contracts deal with the ownership or authorization to deal with or contract for genetic resources.

16 This issue is discussed in the Bonn Guidelines at App. I. Para. A.2, which notes that the ABS contract may state inter alia, 'the legal status of the provider and user of genetic resources'. In general, the 'legal status' does not have a single established meaning, but may refer to the ownership or other rights over the genetic resources.

17 Young, 2006a.

18 Uncertainties regarding the legal authority of the provider have been the impetus behind the Bonn Guidelines' call for each country to designate a national focal point as a coordinating centre of these questions. In order to resolve this question, however, the country must not only designate a competent authority, but also specify in its law or policy exactly who 'has the legal power to grant prior informed consent may delegate this power to other entities, as appropriate'. Bonn Guidelines, at clause 15.

Table 3.2.1.1 Provisions regarding authority over genetic resources

Contract No.	Authority over genetic resources
1	The UNIVERSITY is responsible for acquiring all proper licenses and paperwork to allow the legal transfer of the material to the COMPANY
4	It is agreed that LICENSOR is the sole owner of the plant variety transferred under this Agreement, and has the right pursuant to the national plant breeders' right act to issue a license.
	The LICENSEE shall obtain any other authorizations or permits which may be required in order for the LICENSEE to legally carry out all of its activities under this AGREEMENT. Failure to do so shall be deemed a material breach of this license.
5	[This contract assigns genetic resources between two downstream users outside the Source country] DATA-OWNER represents and warrants that DATA-OWNER is the sole and exclusive owner of the GENETIC INFORMATION
6	The Source Country's approval or rejection of the access permission, will be made in the form of a resolution of the TECHNICAL OFFICE, issued in accordance with the requirements adopted in the Law of Biodiversity, the Norms, the Regulation ex- situ and concordant legislation. [Note: the Source Country is not a party to this contract. The Technical Agency is a government agency of the Source Country.]
	USER must obtain, present and display its authorization/registration received from the TECHNICAL OFFICE pursuant to national law. This documentation, once authenticated by the AGENCY will serve as the primary documentation of authority in all actions under this agreement, serving as a membership card for access for the INSTITUTION.
7	(Option 1 - note this is a model, which provides multiple options) Each of the parties warrants to the other that, to the best of its knowledge and belief, any advice or information or the content or use of any Results, Background or materials, works or information provided in connection with the Project, will not constitute or result in any infringement of third-party rights.
	(Option 2- note this is a model, which provides multiple options) Neither of the parties makes any representation or gives any warranty to the other that any advice or information or the content or use of any Results, Background or materials, works or information provided in connection with the Project, will not constitute or result in any infringement of third-party rights.
12	The Authorized Officials executing this Agreement certify that they are the legal representatives of their respective organizations, authorized to sign on behalf of their respective organizations for the purpose of binding said organizations to the terms of this Agreement, for the transfer specified above.
13	This Agreement is effective when signed by all parties and co-signed by the Chairman of the Genetic Resources and Biotechnology Committee (of the Source Country). All officials executing this Agreement hereby certify that they are the legal representatives of their respective organizations, authorized to sign on behalf of their respective organizations for the purpose of binding said organizations to the terms of this Agreement, for the transfer specified above.
19	Any false or misleading statements made, presented, or submitted to the Source Country (which is not a Party to this Agreement) including any relevant omissions, whether made under this Agreement or at any time during the course of this negotiation, are subject to all applicable civil and criminal statutes under the laws of the Source Country.
20	Upon information and belief, the undersigned [person signing on behalf of INSTITUTION] expressly certifies or affirms that the contents of any statements of the INSTITUTION made or referred to in this Agreement are truthful and accurate
33	PROVIDER shall obtain and maintain all necessary approvals needed to collect, ship and deliver samples to RECIPIENT
39	PROVIDER, UNIVERSITY and FOUNDATION each offer the following statements on behalf of themselves only: It formally represents and warrants to COMPANY that it has all necessary right and authority to enter into and perform this Agreement; and that it is not under any (contractual or other) duty to any third party that conflicts with this Agreement.
	PROVIDER represents and warrants that it has obtained or will obtain all consents, licenses or other permits needed by it to perform this Agreement and will comply with all applicable laws.
40	Each Party shall obtain and maintain all permits, licenses, and other approvals necessary for its collection, transfer, testing and use of Natural Materials under this agreement, including export controls, and environmental laws, from governmental authorities with jurisdiction and from private parties whose authorization is necessary under applicable law; and each member shall comply with all applicable laws and regulations.
41	Each of the Parties represents and warrants for itself that (i) it has the right and authority to enter into and perform this Agreement and to provide Extracts, materials and services hereunder (ii) that it has obtained or will obtain all consents, licensers and other permits needed to perform this Agreement and to export the Extracts and will comply with all applicable laws; that he is not under a duty to, and has not entered into an agreement with any third party that is in conflict with this Agreement, and that prior to this Agreement, it does not own or control any patent rights in any country that relate to the manufacture, use or sale of the Extracts provided hereunder.
	All inventions made by employees or agents of a single Party, including shamans and traditional plant users of the PROVIDER country, are solely owned by that Party or shaman, who shall have the first right to prepare, file, prosecute and maintain patent applications and patents throughout the world in countries of its choice regarding said Subject Invention, at its own expense.

continued on next page

Table 3.2.1.1 Provisions regarding authority over genetic resources (continued)

Contract No.	Authority over genetic resources
SMTA	The Provider [collection or other person/institution transferring PGRFA under the SMTA] makes no warranties as to … title to the material, nor as to the accuracy or correctness of any passport or other data provided with the material

3.2.1.2 Authority of signatory

The authority of the person signing a contract is a highly technical issue, because the contract will be null and void, if that person does not have authority to bind the government, agency, community, company or other party he represents. At most, the contract will only bind the person signing – not the entity. In ABS, this type of concern can be relevant to both the provider and the user or other recipient.

For providers, to the first objective in this area is to protect against intentional or unintentional misrepresentation by the other party.[19] In addition, however, the contract will often need to address the means by which one person can be proven to represent an unincorporated rural community or indigenous group that does not have a clear 'membership' or established corporate structure. In these cases, the process documenting the representation of traditional or rural communities is nearly always unclear. National law addressing this point may not be recognized by the traditional communities. In some cases, a community association may appoint a particular representative, but that representative's position may still be unclear, where for example some members of that community are not part of the association. While it is difficult to resolve this issue by contractual provisions, it is possible for the parties to assign the risk that a particular representative's authority might not be valid.

Table 3.2.1.2 Provisions regarding the authorization of signatories

Contract No.	Representation authority of signatories
10	The UNIVERSITY warrants to the SPONSOR that, in relation to any such assignment: (i) the UNIVERSITY has the right to dispose of the Intellectual Property in the Results and that the University it will, at its own cost, do all that it reasonably can to give the title that it purports to give; and (ii) that the Intellectual Property in the Results is free from all charges and encumbrances and rights of any third party (except those that the UNIVERSITY is unaware or could not reasonably be aware of.
16	PROVIDER Organization Certification: I hereby certify that I am legally entitled to represent the named PROVIDER organization (May be the PROVIDER SCIENTIST if authorized by the PROVIDER organization):
	RECIPIENT ORGANIZATION CERTIFICATION: I hereby certify that I am legally entitled to represent the named RECIPIENT organization (May be the RECIPIENT SCIENTIST if authorized by the RECIPIENT organization):
31	The [Source Country's] Government represented by the Ministry of Agriculture, approves of this collaboration and authorizes AGENCY to take all necessary action regarding the Access and Benefit-Sharing Agreement 'providing the regulations of the international conventions are adhered to'. [Note: In this contract, the Ministry of Agriculture is specifically signing on behalf of the Government (which is the PROVIDER).]
33	PROVIDER represents and warrants that it has the legal authority to negotiate and sign this Agreement.
46	[Contract requires signatures to be witnessed, a process which normally requires that the signatory prove his identity, but may not always require proof of his position, affiliation or authority.]
SMTA	[In SMTA contracts executed by formal written signature only] I, (Full Name of Authorized Official), represent and warrant that I have the authority to execute this Agreement on behalf of the PROVIDER and acknowledge my institution's responsibility and obligation to abide by the provisions of this Agreement, both by letter and in principle, in order to promote the conservation and sustainable use of Plant Genetic Resources for Food and Agriculture.

19 Discussed in 2.3.1.3, above.

The ABS contracts provide few examples of this type of provision. Table 3.2.1.2 includes all such provisions found in any of the 47 quotable contracts included in this study.

3.2.1.3 Ability to complete the contract

In ABS contracts, the parties' capacity and ability to take the required actions is another difficult issue. In conventional contracts, the parties recognize that contractual assurances regarding these issues offer limited protection. It is common to combine these provisions with other research or documentation. In ABS contracts, there is another factor to be considered: A long time may pass between collection of the specimens and the development of a product or invention that can result in benefits. During this time, financial and practical factors relevant to the user may change dramatically.

No provision to address this issue was included in any of the ABS Contracts reviewed, except in contracts provided with the restriction that 'no language contained in the contract may be publicly quoted.' A few provisions address other aspects of ability to meet the contract's obligations. These are included in Table 3.2.1.3.

Table 3.2.1.3 Provisions regarding the parties' financial and legal ability

Contract No.	Legal and financial ability to undertake contract
4	It is a fundamental condition of this agreement that the LICENSEE hereby expressly warrants and guarantees that it has the necessary knowledge, ability, facilities and resources to perform all of the obligations and undertakings to which it has agreed pursuant to this Agreement and all related instruments.
22	LICENSEE represents that it has the facilities, personnel, and expertise to use the Materials for commercial purposes and agrees to expend reasonable efforts and resources to develop the Materials for commercial use and/or commercial research.
27	In the event that a legal action is brought against AGENCY alleging invalidity of the Patent, AGENCY shall notify LICENSEE of such action. AGENCY does not represent that it will commence legal action to defend against such an action.

3.2.1.4 Rights of third parties

One of the clearest differences between ABS contracts and more conventional commercial contracts is the extent to which they affect and are affected by third parties. Table 3.2.1.4 includes the contractual provisions about third parties found in some of the ABS contracts reviewed for this book. As noted in 2.6.3, many contracts specifically intend to benefit one or more third parties in some limited way. It is sometimes advantageous to grant 'third-party beneficiary' status to other persons and communities, as a way of avoiding more serious challenges or negative judicial decisions.

In a few of the reviewed contracts, the specific rights of some third parties are specifically discussed, whether to grant such rights or to claim that no such rights exist. As noted in part 2.6.3, the fact that a third party is not mentioned in a contract does not mean that the party is not a 'third-party beneficiary' to that contract.

Table 3.2.1.4 Rights of third parties

Contract No.	Third-parties beneficiaries
4	Nothing expressed or implied in this License Agreement is intended to, or shall be construed to, confer any rights or remedies on any person, other than the PARTIES and their successors and assigns,
11	Except as specifically listed under Article XXX, neither of the parties makes any representation or gives any warranty to the other regarding any advice or information given by it or any of its employees or students who work on the Project. Neither Party makes any warranty or promise regarding the content or use of any Results, Background or materials, works or information provided in connection with the Project. Neither party makes any warranty that activities under this agreement will not constitute an infringement of third-party rights.

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Table 3.2.1.4 Rights of third parties (continued)

Contract No.	Third-parties beneficiaries
33	RECIPIENT shall code each sample before sending it to COMPANY [COMPANY is a third party to the Agreement]
SMTA	The parties agree that FAO*, acting on behalf of the GOVERNING BODY of the Treaty and its Multilateral System, is the third-party beneficiary under this Agreement
	The third party beneficiary has the right to request the appropriate information as required in Articles 5e, 6.5c, 8.3 and Annex, 2 paragraph 3, to this Agreement.
	The rights granted to FAO* above do not prevent the PROVIDER and the RECIPIENT from exercising their rights under this Agreement
	The PROVIDER shall periodically inform the GOVERNING BODY about the Material Transfer Agreements entered into, according to a schedule to be established by the Governing Body. This information shall be made available by the GOVERNING BODY to the third party beneficiary
	FAO, representing the GOVERNING BODY and the Multilateral System, has the right, as a third party beneficiary, to initiate dispute settlement procedures regarding rights and obligations of the PROVIDER and the RECIPIENT under this Agreement.
	The third party beneficiary has the right to request that the appropriate information, including samples as necessary, be made available by the PROVIDER and the RECIPIENT, regarding their obligations in the context of this Agreement. Any information or samples so requested shall be provided by the PROVIDER and the RECIPIENT, as the case may be.
	* a footnote in the SMTA states that, at present, FAO is designated by the Governing Body to fill this role, which originally was referred to as '(the entity designated by the GOVERNING BODY)'

In addition to commercially recognized third-party beneficiaries, genetic resources agreements may have other third-party beneficiaries, since genetic resources are somewhat different from other types of contractual subject matter. As a new kind of legal or property right,[20] genetic resources often fall within the property controlled directly through the 'sovereign rights' of the country. They are often widely distributed throughout the country, available to all. After the contract, it is possible that some rights in the resources will become at least partially exclusive. Consequently, many other persons, communities, entities, agencies and NGOs, may feel that they have rights under ABS contracts and permits, that they have an interest in ensuring that the country gets correct value for its genetic resources, and that the provisions of the ABS contract are fair, adequately protective and fully complied with.[21] These persons may be considered to have a type of third-party rights under the contract.

3.2.2 Core provisions: Objectives and scope

The objective and scope of the contract may provide evidence establishing the legal rights of the parties. Not all contracts include these statements, which are not an essential element of a contract. Normally, when they are included, these provisions are very straightforward, in describing the basic intention underlying the contract. Many contracts and discussions separate the 'objective' of the contract from its 'scope;' however, for comparative purposes that distinction is often artificial. Accordingly, Table 3.2.2a provides a few examples of how ABS contracts have defined their objectives and scope.

20 Tvedt and Young, 2007, at Chapters 1 and 4.

21 Young 2006a.

Table 3.2.2a Objectives and scope

Contract No.	Objectives and scope
1	The Scope of this contract shall cover a research project dealing with the selection of plant extracts in view of their possible utilisation in agri-business (crop protection and animal health)
2	'SUPPLIER' shall transfer material to ' INTERESTED PARTY,' which material shall be used exclusively for the aims listed below In the PROJECT. To achieve the listed objective.
4	Subject to the provision of this License Agreement, LICENSOR hereby grants to the LICENSEE a non-exclusive royalty-bearing, fixed term licence to use [specified genetic strain] in a breeding program conducted by LICENSEE and to produce, market, sell the resulting variety in the Territory covered by this License Agreement
5	DATA-OWNER hereby grants to the Partnership and its members a non-exclusive license to access the GENETIC INFORMATION provided to the database by DATA-OWNER for non-commercial research purposes only. Access shall be solely for non-commercial, publicly funded research which is not supported directly or indirectly by commercial organizations.
6	Access to genetic and biochemical elements and resources may only occur in situ in the following locations: __[list]__. In addition, this agreement will permit access in to resources held ex-situ in the following locations: _[list]__
12	This Agreement is intended for the collection of agricultural germplasm. An authorisation for collection, strictly under Government licence/permit, allows for the collection of Botanical, Entomological, Mycological, Zoological specimens from designated collection areas only. The collected MATERIAL: (a) is to be used solely for teaching and academic research purposes; (b) will not be used in human subjects, in clinical trials, or for diagnostic purposes involving human subjects without the written consent of the PROVIDER; (c) is to be used only at the RECIPIENT organization and only in the RECIPIENT SCIENTIST's laboratory under the direction of the RECIPIENT SCIENTIST or others working under his/her direct supervision; and (d) will not be transferred to anyone else within the RECIPIENT organization without the prior written consent of the PROVIDER.
16	This agreement is intended both to define trade secret-like protection of Traditional Knowledge from herbalists, including benefit-sharing, and to provide verification of Prior Informed Consent
18	The objective of this contract is to ensure confidentiality if a Patent Application is provided to COMPANY by AGENCY, at COMPANY's request.
21	Any license granted under this Agreement will be subject to a royalty-free, non-exclusive, irrevocable license to the GOVERNMENT to use the Invention(s) for government purposes. The scope of such license shall be as set forth in [specific regulation of law of GOVERNMENT]
22	With this Agreement, AGENCY grants to LICENSEE a worldwide, non-exclusive license to make, have made, use, but not to sell the Materials. For this purpose, 'Materials' [covered under this Agreement] means the following biological materials including all progeny, subclones, and derivatives thereof: [specific specimens, species and varieties described in detail by parties using the form], as described in _[to be filled in by parties]__ and developed in the laboratory of ___[inventor]___.
	Upon receipt by AGENCY of the license issue royalty, AGENCY agrees to provide LICENSEE with samples of the Materials, excluding progeny, subclones, and derivatives thereof ('Supplied Materials'), as available, and to replace such Supplied Materials, as available and at reasonable cost, in the event of their unintentional destruction
25	LICENSEE desires to acquire the rights to use certain of inventions of AGENCY in order to develop processes, methods, or marketable products for public use and benefit. AGENCY hereby grants and LICENSEE accepts, subject to the terms and conditions of this Agreement, a Non-exclusive License under the Licensed Patent Rights in the Licensed Territory to make and to use, but not to sell the Licensed Products and Licensed Processes in the Licensed Fields of Use only
26	AGENCY hereby grants and LICENSEE accepts, subject to the terms and conditions of this Agreement, an exclusive license under the Licensed Patent Rights in the Licensed Territory to make and have made, to use and have used, to sell and have sold, to offer to sell, and to import any Licensed Products in the Licensed Fields of Use and to practice and have practiced any Licensed Processes in the Licensed Fields of Use
27	AGENCY desires to transfer certain inventions to the private sector through commercialization licenses to facilitate the commercial development of products and processes for public use and benefit.

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Table 3.2.2a Objectives and scope (continued)

Contract No.	Objectives and scope
29	This Agreement establishes mutual collaboration between PROVIDER and COLLECTION to fulfil the objectives and activities indicated herein. It is limited to the repatriation of genetic material and associated knowledge for custody by indigenous communities in PROVIDER. It includes, follow-up by both parties to carry out participatory research on the flow and evolution of diversity, classification, variation/geographical distribution and management of materials repatriated to PROVIDER, issues related to the continuity of in situ and ex situ conservation, and other activities which are mutually agreed by the parties. Its objective is to promote the in situ conservation and management, and its relationship with ex situ conservation of genetic resources of native potato. In addition, as far as physical, human and finance resources permit, to multiply, it seeks to ensure the condition of and make available these materials for redistribution to third parties
30	In order to enable bioprospecting, this agreement relates to the creation of an inventory the microorganisms that live in oceans within PROVIDER's jurisdiction, and in soils in some places within PROVIDER or its Territories, to better understand overall species diversity, discover and characterize new bacterial and viral species, evaluate the ecological roles that dominant (but generally unculturable) microbes play in the ecosystem, and establish and publish a freely shared, global environmental genomics database that can be freely used by any person or entity.
31	[The objectives of this Agreement are] .... (1)Taxonomic identification of Material, its progeny or derivatives; (2)Accession of a representative, viable portion of the Material into the collections at the Seed Bank; (3)Processing and viability testing of Material, its progeny or derivatives;
42	The purpose of this Agreement is scientific cooperation, designed to permit scientists from the various Parties to undertake research toward the discovery and development of new medicines and pharmaceuticals from plants found in NATIONAL PARK, the conservation and sustainable utilization of plants and forest biodiversity in NATIONAL PARK, and economic development of [two developing countries in which some of the participating institutions are located.
	Areas of cooperation shall include any program offered at either institution as felt desirable and feasible on either side and that all sides feel contributed to fostering and development of the cooperative relationship between five institutions.
	[This contract's objectives are] (i) to discover new/novel biologically active molecules as candidates for pharmaceutical development for [therapies against specified diseases] from the plants of NATIONAL PARK and other places, collected primarily through biodiversity-based selection, supplemented by interview on medicinal uses; and (ii) to produce a computerized database of seed plants from the collection area within NATIONAL PARK.... which will be published on the internet and in hard copy.
	(iii) To identify... species ... that have demonstrated economic value and have potential for economic development... and to investigate propagation methods for use within the NATIONAL PARK and their production outside of the NATIONAL PARK... (iv) to upgrade facilities and expertise in NATIONAL PARK in plant taxonomy and biodiversity conservation and to strengthen surrounding communities' awareness of the importance of NATIONAL PARK; (v) to produce a database of the plants of PROVIDER's country through ethnobiological field surveys, to broaden the baseline data for selecting candidate species for phytopharmaceutical development... (vi) to transfer technology and strengthen of infrastructures in PROVIDER's country ... and improve the local living standards.
45	The objective of this Agreement shall be (i) to promote dialogue between the parties regarding bioprospecting research and exchanges/training of Source Country scientists, (ii) to allow the shipment of materials from INSTITUTE to COMPANY, and (iii) to allow COMPANY to develop and transfer methodologies, including to participants in Source Country working under [above mentioned ABS Agreement] and (iv) to permit COMPANY to test plant extracts in biological assays to demonstrate their utility for pharmacologic testing and screening.
	All of the terms of this Agreement shall be consistent with [a specific ABS Agreement for obtaining material].
SMTA	The PGRFA specified in Annex 1 to this Agreement (hereinafter referred to as the 'Material') and the available related information are hereby transferred from the PROVIDER to the RECIPIENT. [Annex II] contains a list of the Material provided under this Agreement, including the associated information. This information is either provided below or can be obtained at the following website: (URL). The following information is included for each Material listed: all available passport data and, subject to applicable law, any other associated, available, non-confidential descriptive information. (List)

In addition to these basic provisions, the objective/scope is often defined in the negative, through provisions that explain the limits of the contract's scope. This approach is demonstrated in Table 3.2.2b

Table 3.2.2b Exclusions from scope

Contract No.	Restrictions or exclusions from scope
2	The material cannot be used for any objective or purpose other than the one described in this paragraph, unless the ' INTERESTED PARTY ' shall first receive authorization from 'SUPPLIER'.
12	(i) Endangered, rare and protected species shall not be collected, (ii) Specimens must be collected for scientific studies only and must not be offered in trade.
16	The PROVIDER or the TRADITIONAL KNOWLEDGE PROVIDER retain ownership of the MATERIAL including any MATERIAL contained or incorporated in MODIFICATIONS. Ownership of the intangible components of the MATERIAL that are provided by the TRADITIONAL KNOWLEDGE PROVIDER shall vest with the TRADITIONAL KNOWLEDGE PROVIDER, unaltered by any provision in this Agreement.
18	COMPANY represents that the only purpose of [specific sub-Agreement] is to assess interest in obtaining a license (for bio-collection). COMPANY further represents that [specific sub-Agreement] shall not form the basis for the filing of a patent application or institution of any other proceeding in any patent office or court. COMPANY agrees not to use the information contained in [specific sub-Agreement], except for the purposes stated in this Agreement.
26	On behalf of the GOVERNMENT, AGENCY reserves an irrevocable, non-exclusive, non-transferable, royalty free license for the practice of all inventions licensed under the Licensed Patent Rights throughout the world by or on behalf of the GOVERNMENT and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement to which the GOVERNMENT is a signatory.
	Products embodying Licensed Products or produced through use of Licensed Processes that used or sold in the [Source Country] shall be manufactured substantially in the that country, unless a written waiver is obtained in advance from AGENCY.
	LICENSEE shall not unreasonably deny requests from future collaborators named by AGENCY, for Research Licenses under this project. In the event of such collaboration, LICENSEE may request an opportunity to join the proposed project. To this purpose, AGENCY may grant non-exclusive Research Licenses directly or require LICENSEE to do so, on reasonable terms. AGENCY shall consult with LICENSEE before granting to commercial entities a Research License or providing to them research samples of materials made through the Licensed Processes.
28	RECIPIENT agrees to not to claim ownership over the germplasm received, nor to seek intellectual property right over it and/or its related information.
	RECIPIENT agrees not to use the MATERIAL or its derivatives for commercial purposes or profit making whatsoever, without written prior Approval from PROVIDER.
40	Research Performed under this Agreement shall be performed in accordance with the [separate] Agreement between INSTITUTE and SPONSORING PROJECT. The scope of [that separate] Agreement is hereby incorporated by reference into this Agreement. In the event of a conflict between this Scope of Work and other provisions of this Agreement, however, the terms of this Agreement shall govern.
43	Notwithstanding [other provisions] COMPANY agrees that extracts received from UNIVERSITY shall have previously been screened by [another named company] and its affiliates for human therapeutic and pharmaceutical uses, and that the extracts shall be those which have been declared to be ‚not of continuing interest' under UNIVERSITY's other contracts for biological research.
45	COMPANY's right to test the materials under [separate, specifically named ABS Agreement] shall be only for research purposes, and not for commercialization of any component associated with the material.
SMTA	The RECIPIENT undertakes that the Material shall be used or conserved only for the purposes of research, breeding and training for food and agriculture. Such purposes shall not include chemical, pharmaceutical and/or other non-food/feed industrial uses.

Regarding scope provisions and limitations of scope, the Bonn Guidelines note that the contract should include the following:

- a 'description of genetic resources covered by the material transfer agreements, including accompanying information'; and
- a list of 'permitted uses, bearing in mind the potential uses, of the genetic resources, their products or derivatives under the material transfer agreement (e.g. research, breeding, commercialization).[22]

22 Bonn Guidelines, Appendix 1, clauses B-9 and C-1.

3.2.3 Terminology

Terminology issues pose one of the most difficult quandaries for ABS contracts. As noted in 1.2, the basic concepts and terms in ABS have not yet been agreed internationally. Up to now, ABS-related contracts utilize one of two approaches to terminology:

- Some use the ABS terms as defined in the CBD and/or national law, with no additional clarification.
- Some avoid using any term contained in Article 15 of the CBD or in national ABS laws, choosing instead to use other terms and approaches.

Neither of these options is very satisfactory for the contract lawyer. A contract that uses the existing ambiguous and un-agreed terms will face a legal certainty problem, rendering a court or arbitrator unable to rule on or enforce the contract, which would be deemed 'unenforceable.' Legally, it would be unfair to require either party to take actions or incur costs that he did not agree to, and it would be impossible to be absolutely certain what the parties agreed to if the terms are ambiguous. No court or national law has yet clarified the meaning of primary ABS terms, with contractual certainty.

If the Parties do not use ABS terminology, the contract may not meet the country's legal requirements for granting 'access to genetic resources.' If so, the parties might then have to negotiate a separate contract.[23] To avoid this result, some contracts insert a special (somewhat self-serving) provision stating that the parties have satisfied ABS legal requirements. Unfortunately, unless both the User Country and the Source Country are signatories of the contract, this provision will be of no actual legal effect.

Nearly all ABS contracts include some definitions, both general (regarding the terms and concepts used) and specific to the particular materials and activities of the parties. Table 3.2.3 provides some examples of several relevant definitions that have been used in ABS contracts, including provisions defining the resources being transferred (or retained), the parties involved, the rights undertaken and the resulting products and benefits. (Since the national and CBD definitions are well known, they are not reproduced, below, nor are conventional contractual definitions that do not have potential relevance that is unique to ABS issues.)

Table 3.2.3 Terminology; definitions of key terms most relevant to ABS issues

Contract No.	Terminology; definitions of key terms most relevant to ABS issues
Definitions relevant to the Genetic Resources or Materials, in various stages and forms	
2	For purposes of this Agreement, 'Material' or 'Materials' will be understood to include and refer to those genetic and biochemical elements and resources of the biodiversity maintained in ex-situ or in-situ conditions in the national territory. The specific genetic and biochemical elements and resources of the biodiversity addressed in this Agreement are described as follows:
	(Here shall be inserted a detailed list of the material to be provided under this agreement, including, among other specifications: scientific names, codes, amounts or number of samples or agreements. In addition, it must be stated whether the materials obtained consist of living or dead organism(s), tejido(s), organ(s), embryos, reproductive cells (example; gametes, pollen, ova, semen), vascular fluid (example; blood, sap), residue(s) or excretion(s), macerado(s), extract(s), natural composite(s) isolated substances (such as proteins, nucleic enzymes, lipids, carbohydrates, acids, primary and secondary metabolites and others); cellular cultures, isolated microorganisms, genetic information, gene(s) clone(s), inserted genomic libraries of the organism in recombinant bacteria, amplified nucleic acids and progeny derived from these materials, that can be traceable as such. It is necessary to complete this listing completely, and to indicate the end of the list with the phrase 'Last Line').

23 A real-life example of this situation is found in a case study described in Laird, 1998.

Table 3.2.3 Terminology; definitions of key terms most relevant to ABS issues (continued)

Contract No.	Terminology; definitions of key terms most relevant to ABS issues
12	As part of its attempt to clarify the concepts of ‚derivatives' and 'associated traditional knowledge', this contract uses the following definitions: 'Original Material,' 'Progeny' and 'Unmodified derivatives.' The 'Material' shall not include: (a) Modifications or (b) other substances created by the RECIPIENT through the use of the Material which are not Modifications, Progeny or Unmodified derivatives. The definition of Material includes all intangible components including knowledge pertaining to traditional or indigenous uses of the original Material, except where said knowledge has entered the public domain through publication in recognized scholarly journals. ...
	[For this purpose] 'Progeny' shall mean the unmodified descendant from the MATERIAL, such as virus from virus, cell from cell, or organism from organism including any natural recombinants.
	[For this purpose] 'Unmodified Derivatives' Substances created by the RECIPIENT which constitute an unmodified functional subunit or product expressed by the ORIGINAL MATERIAL. Some examples include: subclones of unmodified cell lines, purified or fractionated subsets of the ORIGINAL MATERIAL, proteins expressed by DNA/RNA supplied by the PROVIDER, or monoclonal antibodies secreted by a hybridoma cell line.
	[For this purpose] 'Modifications' [excluded from the term 'original material']: Substances created by the RECIPIENT which contain/incorporate the MATERIAL. For purposes of this Agreement, the definition of 'incorporate' includes, but is not limited to, any processes involving, uses of, constituents of, or molecular constituents of MATERIAL. Examples include, but are not limited to, chemical derivatives of, analogs developed from, or products chemically modeled after MATERIAL.
30	'Derivative' means anything derived from or using the Materials, including without limitation: (i) improvements, developments, modifications, structural or functional analogs and homologs of the Materials; (ii) expression products, replicates and progeny of any of the above; and (iii) polynucleotides coding for any of the above.
40	'Natural Material' refers to naturally occurring isolated bioactive agents; organisms, samples and extracts containing such agents; genetic material able to express such agents; products structurally based on such agents (i.e. where the bioactive agent provides the lead for development); and products created using in substantial part information, including ethnobotanical or traditional knowledge associated with the agent, organisms, samples or extracts. It does not include materials which are synthesized de novo, cultivated species or ubiquitous materials which are freely available and whose uses are widely known.
43	'Analog' means a compound patterned after the structure of the direct isolate chemical entity but simplified for purposes of ease of synthesis and evolving structure activity relationships. An analog may have more than one intellectual precedent and may depart substantially from the structure of the direct isolate chemical entity.
	'Derivative' means a chemical modification of a direct isolate via a limited number of chemical operations (less than five) so as to impart stability, water solubility, etc.
44	'Derivative' means any discrete chemical compound that has been obtained from material, or an analog of such a compound, a synthetic counterpart to such compound, a variant that is structurally based on the compound or that is otherwise produced using, in substantial part, information contained in or conveyed by the material and genetic material able to express such compounds.
46	In this instrument, unless the context indicates otherwise,
	'Genetic Resources' has the meaning given by the [specific law] and means any material of plant, animal, microbial or other origin that contains functional units of heredity and that has actual or potential value for humanity.
	'Material' means any matter or thing the subject of any category of property rights including Intellectual Property;
	'Product' means Material produced, obtained, extracted or derived through R&D Activity;
	'Sample' means a sample of biological resources collected from the Access Area under a permit issued in conjunction with this Agreement;
SMTA	'Plant Genetic Resources for Food and Agriculture under Development' means material derived from the Material, and hence distinct from it, that is not yet ready for commercialization and which the developer intends to further develop or to transfer to another person or entity for further development. The period of development for the Plant Genetic Resources for Food and Agriculture under Development shall be deemed to have ceased when those resources are commercialized as a Product.
Relevant to the Entities involved in the Agreement or any Assignment of the Agreement	
12	'Nonprofit Organisation(s)': A university or other institution of higher education or an organization exempt from taxation. As used herein, the term also includes Government agencies and departments.
	'CGIAR System': Any or all of the International Agricultural Research Centers of the Consultative Group on International Agricultural Research, such as ILRAD, IRRI, CIP, CIMMYT, and so on. For purposes of this Agreement, the CGIAR SYSTEM is also defined as a NONPROFIT ORGANIZATION.

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Table 3.2.3 Terminology; definitions of key terms most relevant to ABS issues (continued)

Contract No.	Terminology; definitions of key terms most relevant to ABS issues
15	'For-profit Organization(s)': Any private organization or individual that is or is not a engaged in commerce or trade, which is not a NON-PROFIT ORGANIZATION as defined herein.
17	'Traditional Knowledge Provider': Person or persons who consent to provide traditional knowledge (defined herein as intangible components of the MATERIAL) that is not widely known within the country of origin and which has not entered the public domain through publication in a recognized scholarly journal (provide a separate entry below for each person
44	'Industrial Collaborator' means any for-profit institution working in collaboration with INSTITUTE as part of this Agreement and related instruments.
	'Collaborator' shall mean an institution working with INSTITUTE as a non-commercial collaborator of the Source Country.
	'Non-commercial Collaborator' means any public institution, scientific or research institution or a not-for-profit organization working in collaboration with INSTITUTE, as contemplated under this Agreement.
46	In this instrument, unless the context indicates otherwise,
	'Access Party' means the person or persons (individual or organization) named as the Access Party and includes their officers, employees, agents and contractors, or any of them, where the context permits;
	'Access Provider' means the person or persons (individual or organization) named as the Access Provider and includes their officers, employees, agents and contractors, or any of them, where the context permits;
	'Access Provider' [second definition of same term, not inconsistent with the earlier definition – presumably both apply throughout the instrument] means the Access Provider of the Environment and Water Resources and includes any Access Provider or agency of GOVERNMENT that succeeds to the functions of the Access Provider;
47	In this instrument, unless the context indicates otherwise,
	'access permit' means a permit issued in accordance with [specified national legislation], for the purposes of authorizing access to biological resources in the Access Area;
Relevant to the Resources or Rights granted or retained	
27	'Research License' means a non-transferable, non-exclusive license to make and to use the Licensed Products or Licensed Processes as defined by the Licensed Patent Rights, for purposes of research and not for purposes of commercial manufacture or distribution or in lieu of purchase
29	'Repatriation': The return and distribution of components of the knowledge systems such as samples of plant varieties and associated knowledge. The objective of the repatriation is the restoration of these components of the system
39	'Confidential Information' shall mean (i) the methods and techniques for [specimen] collection and preparation of [specimen] extracts; specimen names and descriptions, extracts themselves (which shall be considered 'Confidential information' of PROVIDER without any requirement of their designation as confidential); (ii) the bioassays and identification systems used by COMPANY and UNIVERSITY and any reports regarding extract evaluation efforts by COMPANY and UNIVERSITY (which shall be considered the confidential information of COMPANY and UNIVERSITY without any requirement of their designation as confidential); and (iii) any other material or information designated as confidential by use of the appropriate coding at the time of disclosure or within 30 days thereafter.
46	In this instrument, unless the context indicates otherwise,
	'Access Area' means the Commonwealth area or areas specified in Schedule 2 where the Access Party may have access to biological resources;
	'access to biological resources' has the meaning given by [specific national legislation] and means the taking of biological resources of native species for research and development on any genetic resources, or biochemical compounds, comprising or contained in the biological resources, but does not include activities described in [specific national legislation]
	'access permit' means a permit issued in accordance with Part 17 of the EPBC Regulations, for the purposes of Part 8A of the Regulations, authorizing access to biological resources in the Access Area;
	'biological resources' has the meaning given by [specific national law] and includes genetic resources, organisms, parts of organisms, populations and any other biotic component of an ecosystem with actual or potential use or value for humanity;
SMTA	'Available without restriction': a Product is considered to be available without restriction to others for further research and breeding when it is available for research and breeding without any legal or contractual obligations, or technological restrictions, that would preclude using it in the manner specified in the Treaty.
Relevant to the Products and the financial benefits arising from them	
4	'Sold' or 'Sale' means the commercial or retail sales of any variety created under this License Agreement to customers, without discount, rebate or incentive.

Table 3.2.3 Terminology; definitions of key terms most relevant to ABS issues (continued)

Contract No.	Terminology; definitions of key terms most relevant to ABS issues
13	'Commercial Purposes' The sale, lease, license, or other transfer of the Material or Modifications to a for-profit organization. Commercial Purposes shall also include uses of the Material or Modifications by any organization, including RECIPIENT, to perform contract research, to screen compound libraries, to produce or manufacture products for general sale, or to conduct research activities that result in any sale, lease, license, or transfer of the Material or Modifications to a for-profit organization. However, industrially sponsored academic research shall not be considered a use of the Material or Modifications for Commercial Purposes, per se, unless any of the above conditions of this definition are met
23	'Net Sales' means the total gross receipts by LICENSEE for sales of Licensed Products or from income from leasing, renting, or otherwise making Licensed Products available to others without sale or other dispositions transferring title, whether invoiced or not, less returns and allowances, packing costs, insurance costs, freight out, taxes or excise duties imposed on the transaction (if separately invoiced), and wholesaler and cash discounts in amounts customary in the trade to the extent actually granted. No deductions shall be made for commissions paid to individuals, whether they be with independent sales agencies or regularly employed by LICENSEE or for the cost of collections.
33	'Indigenous Person' or 'Indigenous People' means one or more persons belonging to an ethnic or cultural group living in and having long-standing traditional ties to the sample area.
	'Local Person' or 'Local People' means one or more persons living in or around the sample area, and may include indigenous persons or people.
	'Product' means any commercially valuable, medicinal, pharmaceutical, agrichemical or otherwise useful compound or useful combination of compounds derived from a Sample or sample extract, isolated from a Sample or sample extract, or that is in any way created using or based on information obtained or conveyed in any way by a from a Sample or sample extract.
	'Sample' means any sample of biological material that is distinct from all other such samples as a sample of part of the plant likely to contain significantly distinct active compounds (e.g., roots, leaves, flowers, wood, bark, fruit) from a taxonomically distinct species or subspecies or plant taken from the Sample Area pursuant to this Agreement.
34	'Sample Extract' means a mixture of natural products obtained from a Sample.
39	'Chemical Entity' shall include without limitation, chemical compounds, proteins, carbohydragftes, genes, DNA, RNA or other genetic material.
	'Covered Product' shall include any service making use of a Chemical Entity, or a prodrug, derivative or analog thereof, such as gene therapy.
	'Net Sales Price' shall mean the gross price of any Covered Product as sold by COMPANY or its affiliates, licensees or sublicensees, less (a) discounts allowed and actually taken; (b) credits for returns of or allowances for damaged or outdated goods; (c) transportation charges or allowances actually granted; customs duties or similar charges and (e) sales taxes or other excise taxes or governmental charges paid by COMPANY or its affiliates, licensees or sublicensees that are levied on or measured by the sales of such Covered Products (but not franchise or income taxes of any kind whatever.) Transfers of a Covered Product among COMPANY and its affiliates, licensees or sublicensees shall not be considered a sale for purposes of calculating the Net Sales Price, but subsequent sale of such Product by the Transferee shall be considered a sale.*
	* [NOTE: The Contract excludes the distribution of promotional samples of the Product from the accounting for NET SALES. Also the use of the product prior to first commercial sale is not included in net sales unless the COMPANY receives payment for such use. Where the Product is mixed with other material to create another (different) product, a portion of that new product's net sales shall be included in calculation of the net sales of this Product. The portion is determined on the basis of the relationship among the 'active functional ingredients' of the new product. Under the contract, the precise percentage in such cases will be decided through a future agreement. The contract does not specify the method of determining this percentage, stating that it will be agreed in future. The contract mentions, but specifically does not require, one option for this calculation – to determine the share on the basis of 'the relative value of the various components to the end user.']
40	'Subject Data' means all recorded information first produced in the performance of this Agreement, including the following (which are provided as examples and not intended as limitations): species inventories, ethnobiology, phytochemistry, drug development data, and published works, catalogues, and databases referring to such information produced or compiled as part of the activities of Parties or their assignees and employees.
42	'Lead Compound' shall mean any compound (natural, semi-synthetic or synthetic) with biological activity derived from plants acquired in accordance with this Agreement or its predecessors.
	'Net Sales' shall be determined in accordance with COMPANY's standard accounting procedures.
43	'Subject Invention' means an invention made using an Extract as the source of a new or known chemical compound which display desirable agrochemical properties or which have been chemically modified to display desirable agrochemical properties.

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Table 3.2.3 Terminology; definitions of key terms most relevant to ABS issues (continued)

Contract No.	Terminology; definitions of key terms most relevant to ABS issues
44	'Milestones' means important steps in the development of a commercial product for which the commercial entity making such steps will make payments to RECIPIENT. Examples include the official registration of an agricultural product with a government agency, or an initial filing of an application regarding a new drug.
	'Access Fees' means any revenue other than royalties and Milestones that is provided to RECIPIENT from a commercial entity in connection with scientific or research projects associated with this Agreement.
	'Net Revenue' means INSTITUTE's total gross revenues from (a) royalties, (b) Milestone payments and license fees received from collaborators or derived in connection with the use of materials, (c) Derivatives or intellectual property associated with this Agreement, less (1) international and external costs incurred by INSTITUTE associated with the management of intellectual property; and (2) expenses incurred in the preparation, processing or shipment of material to an Industrial Collaborator; or a Non-commercial Collaborator working in association with this agreement including but not limited to agent's commissions, freight, customs, postage and insurance that cannot be paid for by funds contemplated in this Agreement. Research grants to INSTITUTE, or its collaborators shall not be included in the calculation of net revenue and shall at all times remain under strict control of the party receiving the grant or other funding and shall be used only in such manner and for such purposes as may be specified by the funding source.
46	In this instrument, unless the context indicates otherwise,
	'Confidential Information' means (a) any information described as confidential in Schedule 1 to this instrument and (b) any information that is agreed between the Parties after the Date of this instrument as constituting Confidential Information for the purposes of this instrument
	'Exploitation Revenue' means any monies received by the ACCESS PARTY from third parties arising from the ACCESS PARTY's use of biological resources, including monies received for (a) transferring, delivering, or providing access to Samples or Products; (b) assigning or granting rights (including Intellectual Property) in Samples or Products; or (c) sale; but not including funds received by the Access Party for the explicit purpose of research.
	'R&D Activity' means research or development on a Sample or Product;
	'Sale' means a payment received by the Access Party from a third party in consideration of the transfer to the third party of (a) Products; or (b) Material containing a Product, by way of retail sale
	'Threshold Payment' means the percentage of gross Exploitation Revenue to be paid by the Access Party to the Access Provider in accordance with this Deed;
SMTA	'Product' means Plant Genetic Resources for Food and Agriculture that incorporate [as evidenced, for example, by pedigree or notation of gene insertion] the Material or any of its genetic parts or components that are ready for commercialization, excluding commodities and other products used for food, feed and processing.
	'To commercialize' means to sell a Product or Products for monetary consideration on the open market, and 'commercialization' has a corresponding meaning. Commercialization shall not include any form of transfer of Plant Genetic Resources for Food and Agriculture under Development.

As Table 3.2.3 shows, very few contracts have attempted definitions that would address the most significant conceptual difficulties in ABS situations. In particular, no contract has defined 'research results' although some appear to call for the parties to share them.

The Bonn Guidelines do not specifically include any new definitions, but do suggest that some will be needed. The only specific terminology discussion in the Bonn Guidelines calls for the contract to include specific description of 'the type and quantity of genetic resources, and the geographical/ecological area of activity.'[24]

24 Bonn Guidelines, Art 44.a.

3.2.4 Basic ABS rights and duties

For ABS purposes, the most critical provisions of any ABS contract are those that specify rights and duties relevant to (i) facilitation of access to genetic resources; and (ii) equitable sharing of research results and of the benefits arising from their use.

3.2.4.1 Access and use of genetic resources

ABS Contracts generally do not directly name themselves as 'ABS Contracts.' Similarly, they do not specifically label their access provisions as 'access.' In most of the contracts reviewed, including those that cannot be reproduced in this book, access provisions are primarily descriptive.

[a] Access: Resources and rights granted and retained

Table 3.2.4.1a sets out examples of provisions describing primary access and rights to utilize the genetic resources, as well as the primary restrictions on access – i.e., whether the rights granted are 'exclusive' (granted only to the particular recipient in the contract) or whether the provider may grant similar rights to others.

Table 3.2.4.1a Access, resources and rights granted / Exclusivity or non-exclusivity

Contract No.	Access, resources and rights granted	Exclusivity or non-exclusivity
4	Subject to the provision of this Agreement, LICENSOR grants to the LICENSEE a non-exclusive royalty-bearing, fixed term licence to use [specified genetic strain] in a breeding program and to produce, market, sell the resulting variety in the Territory covered by this Agreement.	
5	DATA-OWNER grants to the Partnership and its members a non-exclusive license to access the GENETIC INFORMATION provided to the database by DATA-OWNER for non-commercial research purposes only. Access shall be solely for non-commercial, publicly funded research which is not supported directly or indirectly by commercial organizations.	
12	This Agreement's authorisation for collection allows the collection of Botanical, Entomological, Mycological, Zoological specimens from designated collection areas only. [NOTE: The form includes a space for description of the material, prior to collection. A description that cannot be scientifically precise. Presumably description will cover the area of collection, the target species or genera, the type of collection activities, etc].	To the extent supplies are available, the PROVIDER or the PROVIDER SCIENTIST agrees to make the MATERIAL available, under a separate agreement having terms consistent with the terms of this Agreement, to other scientists (at least those at NONPROFIT ORGANIZATION(S)) who wish to replicate the RECIPIENT SCIENTIST's research; provided that such other scientists reimburse the PROVIDER for any costs relating to the preparation and distribution of the MATERIAL.
15	[In this Form Agreement, the RECIPIENT is asked to specify the 'description of the material being transferred.' Here also, prior to bio-collection for 'possible commercial applications,' the description will not specifically identify species or varieties collected.]	Duration and exclusivity of RECIPIENT's rights to utilize MATERIAL for COMMERCIAL PURPOSES are has follows: (here describe all exclusive/non-exclusive rights, duration of these rights, and terms for extension of these rights and/or resupply of ORIGINAL MATERIAL)
24	LICENSEE wishes to obtain a temporary right to evaluate the commercial applications of the Licensed Products and any inventions claimed in the LICENSED PATENT RIGHTS	LICENSEE acknowledges that the AGENCY may ask third parties to evaluate the Licensed Patent Rights, Products or Materials for a variety of commercial purposes, and no guarantee can be made, that any license which LICENSEE might later request would be available. AGENCY agrees to notify LICENSEE promptly if another company applies for an exclusive license in these elements.
29	The parties recognise the role of the PROVIDER in developing a community protocol for the management of knowledge systems, in accordance with the customary rights and responsibilities of the communities, and agree to implement this Agreement in such a way as to reflect the principles of open sharing for mutual benefit and for the benefit of humanity	

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Table 3.2.4.1a Access, resources and rights granted / Exclusivity or non-exclusivity (continued)

Contract No.	Access, resources and rights granted	Exclusivity or non-exclusivity
30		Nothing in this Agreement prevents PROVIDER from exploiting the Materials, the Results or any other modifications or Derivatives, distributing the Materials, or any other modification or derivatives to any third party, including both profit and non-profit organizations.
		Any use of such data for commercial purposes will be subject to PROVIDER's rights (including the negotiation of a new agreement governing such use.) So long as it complies with these requirement, nothing in this Agreement is intended to prevent any person or entity (including PROVIDER and the RECIPIENT) freely using all data published or made publicly available under this Agreement for any purpose, including for research and development.
33		PROVIDER shall not release, deliver or disclose to any other party any Sample for a period of 36 months after delivery by PROVIDER to RECIPIENT of a particular sample, except that if RECIPIENT fails to conduct R&D aimed at developing a Product fro the Sample, or fails to report on such R&D as required under this Agreement, within 12 months after delivery of that Sample then the PROVIDER has the right to release, deliver or disclose the sample to a third party.
39		COMPANY may use Samples solely for the purpose of identifying and/or developing potential human or veterinary medicinal agents or precursors thereof.
	To the best of its knowledge and ability, PROVIDER will ensure that none of the new Samples provided under this Agreement, shall have been previously provided, directly or indirectly, to any third party within three years prior to provision of the Sample to COMPANY. After providing a sample to COMPANY, PROVIDER will not knowingly provide any residual sample to any third party until COMPANY declares the Sample is 'inactive' [*see* reporting] and will not negligently or knowingly provide any sample of an 'active extract' to any third party until the COMPANY has informed PROVIDER that COMPANY has no continuing interest in the Sample [*see* reporting]. PROVIDER shall be free to supply inactive extracts to any person or entity at any time.	
40	The Parties shall have the right to use all Subject Data for any research purpose, but shall not release Subject Data publicly, except after review prior to the publication of Subject Data to assure that no Proprietary Information is released and that IPR are not jeopardized.	
	The Subject Data shall be jointly owned by the parties to this agreement, subject to disposition of IPR, as set forth herein.	The Parties recognize that there are independent efforts to identify and isolate Natural Materials by various parties to this Agreement and others and intend to be bound by the terms and conditions of this Agreement only to the extent that they perform work under this Agreement
41	PROVIDER will prepare [number] of Extracts each year, and will provide these extracts to COMPANY for biological screening. COMPANY agrees to screen [number] of extracts each year. The Parties may from time to time and by mutual agreement revise the actual number of Extracts to be screened based on resources available. ... COMPANY shall have the sole right to determine the biochemical and biological screens, assays and tests to be applied by COMPANY to each Extract, except that COMPANY agrees to screen all Extracts for anticancer and antibacterial activity.	
42	UNIVERSITY will provide financial support for the implementation of specific educational exchange and training programs at the PROVIDER COUNTRY INSTITUTIONS, in the amount presented in [projects of SPONSORING AGENCY] subject to adjustments depending on the actual amount awarded.	
43	COMPANY shall have the sole right to determine the biochemical and biological screens, assays and tests to be applied by COMPANY to each extract, and shall have six month period of exclusivity with regard to those samples, which provisions shall be limited to agricultural applications, more specifically for insecticidal, fungicidal and/or herbicidal activity.	
	It is agreed that once the six-month exclusivity shall have expired, COMPANY shall continue to have non-exclusive access to all extracts, pursuant to this Agreement.	
44	Before collecting any material, RECIPIENT shall present a request following the procedures established by the PROVIDER. Approval of this request shall be valid for one year, and shall permit collection of no more than [dry weight amount] of each species, unless RECIPIENT requests and PROVIDER approves a greater amount.	
46		As between the parties the ACCESS PARTY has the exclusive rights to all Samples and Products

[b] Provider's Duties: Rights granted and retained

Table 3.2.4.1b1 provides examples of the specific responsibilities of the provider, including the rights, powers and resources that are reserved or withheld by provider and/or that are or may be re-granted to the provider.

Table 3.2.4.1b1 Provider's duties

Contract No.	Providers genetic resources-related duties	Rights retained (not granted, or re-granted) by provider
1	The UNIVERSITY shall provide exclusively to the COMPANY 120 plant extracts (2 g per extract) per year for testing in the field of agribusiness (crop protection and animal health).	Extracts/Plants that are either inactive or uninteresting for the COMPANY shall, upon the COMPANY's declaration thereof, be at the UNIVERSITY's free disposal and shall then no longer be covered by this Agreement.
	[If the results are considered as promising by the COMPANY the UNIVERSITY will, at the request of the COMPANY, collect 3 kg of plant material and send 20 g of plant extracts of the 'Selected Plant'.	Where the COMPANY and the UNIVERSITY agree, the UNIVERSITY may also carry out the investigation on some active plants and provide the results exclusively to the COMPANY. The costs of investigations shall be covered by [to be stated].
4	LICENSOR shall, for the term of this License Agreements, maintain a supply of Breeder seed of the license genetic resources and further agrees to provide it periodically to LICENSEE, from time to time, for a fee established by the [name of relevant agency].	
5	USER expressly declares that it will respect and undertake to protect the knowledge of indigenous and local communities, and their practices and innovations associated with the genetic and biochemical resources, in accordance with national law.	
12	The PROVIDER retains ownership of the MATERIAL, including any MATERIAL contained or incorporated in MODIFICATIONS. The RECIPIENT retains ownership of: (a) MODIFICATIONS (except for ownership rights to the MATERIAL included therein as in 1), and (b) those substances created through the use of the MATERIAL or MODIFICATIONS, but which are not PROGENY, UNMODIFIED DERIVATIVES or MODIFICATIONS (i.e., do not contain the ORIGINAL MATERIAL, PROGENY, UNMODIFIED DERIVATIVES). If either 2 (a) or 2 (b) results from the collaborative efforts of the PROVIDER and the RECIPIENT, joint ownership may be negotiated.	The PROVIDER retains ownership of the MATERIAL, including any MATERIAL contained or incorporated in MODIFICATIONS. The RECIPIENT retains ownership of: (a) MODIFICATIONS (except for ownership rights to the MATERIAL included therein as in 1), and (b) those substances created through the use of the MATERIAL or MODIFICATIONS, but which are not PROGENY, UNMODIFIED DERIVATIVES or MODIFICATIONS (i.e., do not contain the ORIGINAL MATERIAL, PROGENY, UNMODIFIED DERIVATIVES). If either 2 (a) or 2 (b) results from the collaborative efforts of the PROVIDER and the RECIPIENT, joint ownership may be negotiated.
16	The above BIOLOGICAL MATERIAL is the property of the PROVIDER and is made available as a service to the academic research community	The above BIOLOGICAL MATERIAL is the property of the PROVIDER and is made available as a service to the academic research community
17	The PROVIDER or the TRADITIONAL KNOWLEDGE PROVIDER retain ownership of the MATERIAL including any MATERIAL contained or incorporated in MODIFICATIONS. Ownership of the intangible components of the MATERIAL shall vest with the TRADITIONAL KNOWLEDGE PROVIDER as to intangible components provided by said TRADITIONAL KNOWLEDGE PROVIDER.	The PROVIDER or the TRADITIONAL KNOWLEDGE PROVIDER retain ownership of the MATERIAL including any MATERIAL contained or incorporated in MODIFICATIONS. Ownership of the intangible components of the MATERIAL shall vest with the TRADITIONAL KNOWLEDGE PROVIDER if said intangible components of the MATERIAL have been provided by said TRADITIONAL KNOWLEDGE PROVIDER.
29	Depending on the resources, PROVIDER shall: a) maintain viable genetic material for distribution and sowing by members of PROVIDER and third parties; b) maintain access to the genetic material; c) When necessary, obtain the consent of other indigenous and local community organizations for the redistribution of repatriated native crops; d) observe the terms and conditions of relevant regulations; e) inform COLLECTION of relevant conservation activities; and f) participate in collaborative research	
31	RECIPIENT will not Commercialize any Genetic Resources transferred under this Agreement. Without prejudice to the above, any Commercialisation to which the Parties may subsequently agree will be subject to a separate written agreement.	

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Table 3.2.4.1b1 Provider's duties (continued)

Contract No.	Providers genetic resources-related duties	Rights retained (not granted, or re-granted) by provider
33	PROVIDER shall supply samples to the RECIPIENT in regular batches of an agreed size, in a form and manner acceptable to RECIPIENT for screening, and pursuant to criteria established in this agreement, both as specified in [technical criteria of the Agreement], as promptly as practicable. It shall label all samples providing [list of information to be provided including name, location of collection and other information], and shall ensure that each sample is taxonomically authenticated according to generally accepted scientific standards, with an adequate record of such authentication delivered to RECIPIENT with the sample.	
34	[Note, this is a 'downstream contract' so these are duties of initial recipient under another contract.] TRANSFEROR shall use its best efforts to provide SCIENTIFIC INSTITUTE with a minimum of 1200 Sample Extracts per annum for purposes of bioactivity screening only. It shall label all samples with the name of the species or code label supplied.	
35	[Note, this is a 'downstream contract' so these are duties of initial recipient under another contract.] [in addition to primary provisions for supplying samples to COMPANY, as above] TRANSFEROR shall characterise any Sample Extract exhibiting by bioactivity by bioassay-guided fractionalization to isolate and identify the Sample Compound responsible for the observed activity. It shall use its best efforts to obtain additional quantities of such Sample from collectors [presumably providers] to perform bioassay-guided fractionalization. TRANSFEROR may contract with [other Universities] to perform fractionalization, provided that TRANSFEROR is the sole and exclusive agent for licensing Patents under any such agreements.	
37	[Note, this is a 'downstream contract' so these are duties of initial recipient under another contract.] [Wherever in this contract, a duty to pay costs, royalties or other payments between TRANSFEROR and TRANSFEREE UNIVERSITY are mentioned, in essence as in prior contracts set out above, this Agreement also specifically recites the obligations of TRANSFEROR to pay royalties to the Collector and Extractor, as set forth in Contracts 33 and 36 and others, which are linked to this contract.]	
39	PROVIDER will arrange for the provision, in accordance with the terms of this Agreement, to COMPANY of ___ extracts (Samples) or such greater number as PROVIDER and COMPANY may mutually agree in writing from time to time. [detailed provisions for the preparation, labeling and packing/shipping of samples.	
42	The assistance to be provided by each of the contracting parties will be teaching, research, exchange of faculty and students, and staff development, etc., as deemed beneficial by the five institutions [that are party to this Agreement.]	
	In the event of an award, PROVIDER COUNTRY INSTITUTION will provide personnel, space and facilities for the implementation of [specified training program] and will select appropriate junior scientists for training in [one of the countries involved in the Agreement] in areas of scientific expertise stipulated by the Parties.	
43	Plant samples will be collected in Source Country by PROVIDERS using random collection procedures and by other authorized bioprospecting RECIPIENT.	
SMTA	All available passport data and, subject to applicable law, any other associated available non-confidential descriptive information, shall be made available with the PGRFA provided.	The RECIPIENT undertakes that the Material shall be used or conserved only for the purposes of research, breeding and training for food and agriculture. Such purposes shall not include chemical, pharmaceutical and/or other non-food/feed industrial uses
	Access to Plant Genetic Resources for Food and Agriculture under Development, including material being developed by farmers, shall be at the discretion of its developer, during the period of its development;	

In addition to these basic provisions, a number of contracts have addressed a specific question – the possible need to resupply the recipient with additional samples of some species or variety. These provisions have been identified as very important in some case studies.[25] As a consequence, a number of contracts have specifically addressed resupply questions. A sampling of these provisions is found in Table 3.2.4.1b2.

25 Laird and Lisinge, 1998.

Table 3.2.4.1b2 Re-supply

Contract No.	Re-supply
33	RECIPIENT shall maintain records so that it can, as far as is reasonably possible, request PROVIDER to prepare additional quantities of the Samples where RECIPIENT specifies in order to conduct additional testing of such samples. PROVIDER shall respond within a reasonable time, depending on the season, to any such request for additional quantities of a sample from RECIPIENT.
39	With respect to any Sample previously provided as set forth above, PROVIDER will use best efforts upon request of COMPANY to resupply COMPANY with [quantity] of such sample, meeting the same standards described above, provided however that PROVIDER shall have not obligation to supply any additional quantities in excess of the [measurement] within a specified lifecycle season of the species. The timing of such resupply shall be mutually agreed by PROVIDER and COMPANY at the time of the Resupply request.
40	All licenses and other rights granted to third parties in compliance with this Agreement shall contain a provision requiring the licensee to obtain any required Natural Materials from the Source Country as its first source of supply, to the extent it is commercially feasible. In cases where large samples of the plant material will be required for follow-up studies, the licensee will provide a written statement that the material will be collected in a sustainable manner.
43	COMPANY shall screen each extract for use as an agricultural agent, more specifically, for insecticidal, fungicidal and/or herbicidal activity
	If requested by any of the Parties which are research institutes, the PROVIDER will provide the requesting Party with reasonable additional amounts of sample extracts previously provided, for the purpose of confirmatory bioassay or for the isolation of active constituents, provided grant funds received are adequate for the Resupplies or Recollection or both of the above, the requesting Party shall have the option to provide funds to Resupply or Re-collection of the above samples. UNIVERSITY agrees to coordinate the research so that grant funds will normally be available for the preparation of the Resupplied samples for isolation of active constituents for 10% of the extracts initially provided. PROVIDER and RECIPIENT will assist UNIVERSITY by providing any additional information that may be relevant to the evaluation of the extracts.
	COMPANY will in good faith seek to utilize Source Country as a source of supply and/or cultivation for raw materials required for the manufacture of a product commercialized by COMPANY under this Agreement provided that such material can be available in quantities, quality and time frame sufficient for COMPANY's needs, and at a mutually agreeable fair price.
44	All re-collection of additional specimens shall be approved by PROVIDER. If a quantity greater than that authorized in the initial collection is required, then INSTITUTE shall consult with PROVIDER offering due justification. The procedures for approval shall be subject to the same terms as collection.

[c] Recipient's duties (beyond payment/sharing)

Finally, Table 3.2.4.1c contains some examples of the 'access side' of the recipient's obligations (apart from any payment or direct sharing requirements).

Table 3.2.4.1c Recipient's non-payment duties

Contract No.	Recipients' rights and duties, apart from payment and in-kind payment, and restrictions
12	At the time of collection, a duplicate of each specimen must be deposited with the National Herbarium. An annotated list of all species collected must be filed three weeks after expiry of this Licence. This licence must be carried at all times when collecting and shall be available for inspection by a Government officer on demand.
15	The RECIPIENT shall have the right, without restriction, to distribute substances created by the RECIPIENT through the use of the ORIGINAL MATERIAL only if those substances are not MATERIAL or MODIFICATIONS, as herein defined.

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Table 3.2.4.1c Recipient's non-payment duties (continued)

Contract No.	Recipients' rights and duties, apart from payment and in-kind payment, and restrictions
16	The BIOLOGICAL MATERIAL will be used for teaching and academic research purposes only. It will not be further distributed to others without the PROVIDER's written consent. The RECIPIENT shall refer any request for the BIOLOGICAL MATERIAL to the PROVIDER. To the extent supplies are available, the PROVIDER or the PROVIDER SCIENTIST agrees to make the BIOLOGICAL MATERIAL available, under a separate Agreement with the original PROVIDER and THIRD PARTY, to other scientists (at least those at nonprofit organizations or government agencies).
17	In the event that AGENCY, the INSTITUTION or their licensees, learn of any substantial infringement of any patent subject to this Agreement, he shall promptly notify the other party in writing and provide the other party with all available evidence relevant to that infringement. AGENCY and its licensees shall use their best efforts to eliminate such infringement without litigation. If these efforts are not successful within ninety (90) days after the infringing party has been formally notified of the infringement, AGENCY shall have the right, after consulting with the INSTITUTION to commence a lawsuit.
24	AGENCY agrees, after receipt of the payment required by this Agreement, to provide LICENSEE with samples of the Materials excluding progeny, subclones, and derivatives thereof ('Supplied Materials'), as available, and to replace such Supplied Materials, as available and at reasonable cost, in the event of their unintentional destruction.
30	The RECIPIENT must only use the Materials and Results for the Approved (taxonomic and geonomic) Research in accordance with the Access Proposal (prepared under this Agreement), and must not make Derivatives from the Materials
	The RECIPIENT must keep the Materials secure and under the personal care and control of the Lead Investigator or their delegate. The RECIPIENT must notify PROVIDER immediately the name and contact details of any delegate so appointed
	The RECIPIENT warrants that the Approved Research is non-commercial and that the RECIPIENT, and to the best of the RECIPIENT's knowledge no associated entity of the RECIPIENT, or any entity that carries on or proposes to carry on any business with RECIPIENT, holds any option, licence or other rights to the use or commercialisation of the Materials or the Results, or Intellectual Property arising from the Approved Research
31	RECIPIENT will ... (5) Store the seeds and herbarium specimens, whether in local collections or held in foreign collection sites for safe-keeping and long-term conservation; .... (8) Conduct taxonomic research upon the herbarium specimens, their progeny and/or derivatives; .... and (9) Conduct seed viability tests upon the seed, its progeny or derivatives to determine its longevity and for conservation purposes.
33	RECIPIENT will screen all samples for potential projects using COMPANY's standard screening methods and criteria for evaluating commercial potential. RECIPIENT will also screen samples for uses relating to specific diseases common to the population of [source country], such as tuberculosis and cancer. RECIPIENT shall notify PROVIDER of positive results, and if neither RECIPIENT nor COMPANY chooses to pursue commercialisation of the substance, shall cooperate on arrangements for PROVIDER to pursue commercialisation or publication if PROVIDER so chooses.
34	COMPANY shall perform bioassay screens of fractions of Sample Extracts from TRANSFEROR for (particular pharmacological activity).
	SCIENTIFIC INSTITUTE will provide TRANSFEROR with a copy of all data and a summary report of each bioassay screen performed by SCIENTIFIC INSTITUTE within 90 days following receipt of a particular Sample Extract. COMPANY and TRANSFEROR shall keep all data and summary reports confidential and shall not publish or authorise publication of data and summary reports with respect to a particular Sample Extract or Sample Compound, until TRANSFEROR has had an opportunity to file a patent application in the United States relating to a particular Sample Compound.
35	COMPANY shall perform bioassay screens of fractions of Sample Extracts from TRANSFEROR for the following types of activity, selected in COMPANY's sole discretion: herbicidal, insecticidal, fungicidal, animal growth regulatory, anticoccidial, antiparasitic, cardiobascular, anticancer, anti-infection, anti-inflammatory, central nervous system-related, immunoregulatory, metabolic disease related and antiviral. COMPANY shall also perform bioassay screens of fractions provided by TRANSFEROR, to assist in the isolation of Sample Compound(s) responsible for the observed activity of interest.
39	COMPANY shall have the sole right to determine the biochemical and biological screens, assays and tests it shall apply to the samples.
	Except as required by [the government of the country with jurisdiction over COMPANY], COMPANY shall have no obligation, express or implied to commercialize any of the Samples provided under this Agreement.
41	UNIVERSITY will (i) perform overall coordination of the PROJECT under which the contract is entered into; (ii) implement research design and activities including the screening of plant samples and extracts… (iii) perform isolation, structure elucidation and characterization of biologically active compounds in ... bioassay systems and laboratories as described in [appropriate documents]

Table 3.2.4.1c Recipient's non-payment duties (continued)

Contract No.	Recipients' rights and duties, apart from payment and in-kind payment, and restrictions
42	COMPANY shall notify the Parties whenever it decides to proceed with the development of any compound derived from plants supplied pursuant to this Agreement. In the event of a decision not to proceed with the development of a compound, the COMPANY and other Parties shall discuss in good faith alternative methods of commercialization of such compound with a view to maximizing the value in such compounds. Such discussion shall include, where appropriate, suitable remuneration to COMPANY based on the respective contribution of COMPANY and other Parties.
43	All Parties agree that PROVIDER may perform screening for antibiotic activity and some pharmacological assays [note: this is otherwise an agroscience oriented contract] in order to contribute to the scientific improvement of traditional remedies.
46	In the course of collection and other activities under this Instrument, ACCESS PARTY will comply with the conditions specified in [appended list]; carry on its activities to a high standard and in accordance with relevant best practice, including any policies, codes of practice or guidelines specified in this agreement or attachments, or required by the ACCESS PROVIDER by notice, from time to time; comply with all relevant laws; obtain and hold all necessary approvals and licences; comply with the conditions of such instrument permits; and liaise with the Access Provider, provide any information the Access Provider may reasonably require and comply with any reasonable request made by the Access Provider.
	Where any activity involves the use and care of living non-human vertebrate animals or tissue for scientific purposes, the ACCESS PARTY will obtain review of and approval for such scientific purposes from a recognized animal ethics committee operating under the [national legislative regime on animal ethics], and will comply with all applicable laws, policies, codes of practice and guidelines relating to animal welfare

The Bonn Guidelines specify relevant elements of MAT, which should include the 'obligation to comply with the material transfer agreement'; and a 'duty to minimize environmental impacts of collecting activities.'[26]

3.2.4.2 Monetary provisions and other benefits

Few contracts discuss the equitable-sharing aspects of ABS; and where the issue is mentioned or addressed, those discussions are not complete. A few contracts (fewer than 20% of all contracts reviewed) mention non-monetary benefits. Those provisions, however, are relatively non-specific. For example, such provisions note that research results shall be shared, call for capacity-building or mention other non-monetary benefits of the contracts. Only about 15% of contracts reviewed specifically discussed benefit-sharing mechanisms, payments or activities, and most of these provisions are contained in contracts that are subject to complete confidentially (not quoted in this book.)

The lack of benefit-sharing provisions is not unexpected, given that many of the contracts reviewed in this book are between downstream-users, and do not mention any obligation to the original Source Country. The tables in the following sections present a selection of the benefit-sharing and other payment provisions in the contracts reviewed, divided into three categories:

- payments for access and/or collection services (i.e., a flat payment per specimen collected and provided to the collector);
- monetary payment; and
- other sharing of the analytical and commercial results that are obtained (benefit sharing).

26 Bonn Guidelines, Appendix 1, clauses B-1. *See* also Articles 45-50.

[a] Payments for access

Table 3.2.4.2a contains examples of provisions through which the user or recipient pays for access to genetic resources. These are payments not based on benefits received by the user. They generally include payments based on the particular specimens collected, the right to enter property to collect specimens, and other payments to Source Countries. 'Payments for access' exclude royalties and other percentage payments.

Table 3.2.4.2a Payments for access

Contract No.	Payments for access / Provider's use of material
1	COUNTRY shall, for the term of this LICENSE AGREEMENT, maintain a supply of Breeder seed of YYY and further agrees to provide the LICENSEE, from time to time, with new Breeder seed of YYY for a fee established by the [relevant agency].
12	RECIPIENT agrees to compensate PROVIDER for transfer of ORIGINAL MATERIAL as described herein (examples include monetary compensation, access to scientific information, technology transfer, or provision of research services):
	The RECIPIENT will pay to the UNIVERSITY compensation of US Dollars 400 (four hundred) in return for a 3 kg sample of specified plant material and 20 g of plant extracts of each 'Selected Plant' identified by the COMPANY
33	RECIPIENT shall pay PROVIDER in advance the amount budgeted for capital equipment and collecting/herbarium supplies, plus 25% of the amount budgeted for other expenses for the first year, as soon as practicable prior to the collection of any samples, in order to initiate the agreed-upon workplan. RECIPIENT shall pay personnel and travel costs budgeted for the first year to PROVIDER in advance on a quarterly basis as soon as practicable.
	After the first anniversary of this Agreement, if PROVIDER continues to fulfil its obligation to supply Samples, RECIPIENT shall pay PROVIDER the amounts budgeted for years 2-5 on a quarterly basis, subject to the availability of funds from the granting agency. RECIPIENT shall use its best efforts to pay personnel costs for years 2-5 in advance on a quarterly basis, subject to the availability of funds from the granting agency.
39	COMPANY shall compensate PROVIDER for its research efforts on the basis of [a specific schedule per sample or volume of samples, where samples are provided from existing collection] for initial provision of samples, and for subsequent provision of samples, in such amount as PROVIDER and COMPANY shall agree upon in writing during that period.
	COMPANY will compensate PROVIDER for its research efforts in recollecting material, including efforts to meet resupply obligations.
	COMPANY will provide to PROVIDER at no cost to PROVIDER, equipment and materials that may be available from COMPANY for user by PROVIDER in conducting the research. A list of such equipment shall be mutually agreed upon by PROVIDER and COMPANY after the date of this agreement. [delivery instructions and dates, specified.]

[b] Benefit-sharing

Up to now, available information regarding benefits has been relatively limited, and primarily based on contracts involving non-commercial users. The author has had an opportunity to review a number of contracts, which are not publicly available, in which benefit-sharing provisions were included.

The author's general survey of all contracts (quotable and confidential) has discerned a number of trends, based on whether the contract is primarily research/taxonomic in nature or commercial/R&D oriented. First, in contracts granting a user a broad right to bioprospect (to collect and remove a large or unspecified number of species or varieties), the source country central government usually expects to receive a high volume of data and samples (often, the user is asked to provide a sample of everything taken) and a share of analytical data when it becomes available.

Under these contracts, future rights may be addressed in several ways. Either (i) the provider specifically retains the right to develop these resources independently (ii) the user specifically obtains the right to share data by transfer to other researchers or by publication; or (iii) the contract is silent on future development options. In these contracts, where the bioprospector receives post collection rights to transfer the resources to others or to publish them, the contract's benefit-sharing provisions are normally more expansive, calling on the user to provide in-kind services, equipment and capacity-building, in addition to the initial obligation to provide samples and analytical data.

By contrast, in contracts for R&D (whether non-commercial or commercial), the key factor appears to be the extent of the user's rights. If the user obtains an exclusive right to utilize genetic resources, or the power to take an action that converts his rights to exclusivity (i.e. by filing and IPR on the naturally occurring genes, rather than on his innovations), then provisions addressing the provider's interests will often be more directly focused on financial benefits. Where the user does not receive exclusive rights, or commits not to patent the genetic information (or synthesis) he obtains in a way that would prevent the provider from obtaining his own patent for synthesis of the genetic or biochemical characteristics of the specimen, the benefit-sharing provisions are usually very similar to those applicable to 'taxonomic' ABS contracts, as described above.

Table 3.2.4.2b includes all quotable benefit-sharing provisions contained in contracts reviewed. Many of the contracts involving Source Countries do not contain any benefit-sharing provisions.

Table 3.2.4.2b Benefit-sharing provisions

Contract No.	Monetary and non-monetary benefit-sharing
1	The COMPANY agrees to grant the UNIVERSITY in connection with the Project a fellowship for the period of 3 (three) years. The amount of such fellowship covering salary and consumables shall be $_____ for each calendar year, paid by in advance in January of each year.
2	Under this Agreement, the distribution of benefits derived from the use of the materials will be determined by agreement between 'INTERESTED PARTY' and 'SUPPLIER', on the basis of the objectives stated in the Convention of Biological Diversity (1994) and the Law of Biodiversity (1998), including in the form of capacity-building, technology transfer, collaborative investigations and infrastructure investment.
4	The LICENSEE shall pay to LICENSOR a royalty of 3.5 cents per pound of certified seed resulting from the use of the [specific genetic strain] in the LICENSEE breeding program, sold by the LICENSEE for domestic sales and sold for export sales . The royalty shall be paid by the LICENSEE to LICENSOR by August 1 of each calendar year. Royalties collected by the LICENSEE shall be paid to LICENSOR not later than [date] of each calendar year with respect to sales effected up to [date] of the current year.
12	In the event that RECIPIENT derives income from the use, sale, or licensing of MATERIAL or MODIFICATIONS for COMMERCIAL PURPOSES, RECIPIENT shall share a percentage of said income, such as a royalty, with PROVIDER. Specific terms of said income-sharing may be specified in an attachment to this Agreement, or may be negotiated at a later date, as specified herein [Parties using the form to indicate 'terms attached' or 'to be determined'].
	The PROVIDER shall share all income resulting from the use, sale, transfer or license of MATERIAL or MODIFICATIONS with individuals, organizations, or communities in the country of origin, as mandated by national regulations. In the absence of said national regulations, specific terms of said income-sharing may be specified in an attachment to this Agreement, or may be negotiated at a later date, as specified herein [Parties using the form to indicate 'terms attached' or 'to be determined'].
17	The Provider and the Recipient shall share any benefits basing on either the Benefit-Sharing Formula, or Regulations or Laws of Malawi if so existent and applicable. In absence of the above, the PROVIDER and RECIPIENT shall enter into legally binding negotiations on best-practice method of sharing benefits. In particular, the PROVIDER shall share such income with the TRADITIONAL KNOWLEDGE PROVIDER, provided that said income derives, in whole or in part, from the contribution of the transferred intangible component of the MATERIAL provided by said TRADITIONAL KNOWLEDGE PROVIDER.
23	As part of LICENSEE's performance under this Agreement, LICENSEE agrees to make Licensed Products available to the public within _____ months
29	Subject to availability of resources, COLLECTION shall record and protect community knowledge systems related to PGRFA, and support the right of the communities to an equitable share of the benefits gained from the use of PGRFA. It shall also carry out actions to integrate community activities as a unique part of agricultural research and development which complement modern approaches, and explore alternatives for a respectful interaction between these two approaches and the development of innovative strategies in this field
	Depending on its human, financial and physical capacity COLLECTION shall: a) prepare and make available the genetic material for its repatriation, and b) guarantee the good condition of that material. The repatriated material must be free of known pests and disease, or have gone through pest and disease eradication, c) provide technical assistance to PROVIDER for the maintenance, monitoring and multiplication of seed and management of the repatriated genetic materials.
30	The RECIPIENT acknowledges that the Materials sourced from PROVIDER's jurisdiction are of considerable value in terms of research use and the development of a freely-shared global environmental genomics database. The RECIPIENT will share the Results, assessment of data, samples as reasonably requested, and provide reasonable assistance in their assessment or interpretation.

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Table 3.2.4.2b Benefit-sharing provisions (continued)

Contract No.	Monetary and non-monetary benefit-sharing
33	RECIPIENT shall pay PROVIDER a royalty amounting to 5% of any net royalty received by RECIPIENT from COMPANY, derived from net sales of a Product (as defined in contract). Such payment shall be made within 90 days following receipt of such royalty by RECIPIENT.
	In the event that a Sample or information a provided by an ethnobiologist or local person or people, or material collected from indigenous territory leads to the identification of a Sample from which is ultimately derived a Product (as defined in Agreement) for a use similar to the one specified by the ethnobiologist, or the local person or people, RECIPIENT shall deposit 50% of any royalty received by Recipient derived from net sales of that Product into a trust fund for specific local needs and conservation projects in [source country] to be established and maintained by mutual agreement between PROVIDER and RECIPIENT.
	RECIPIENT shall not be obligated to pay any royalties on a particular Product (as defined) until it has fully recovered its out-of-pocket costs for intellectual and industrial property protection, including patent protection and licensing, from any royalty income it receives derived from net sales of such Product.
	[other benefits] During each annual period following the effective date of this Agreement, PROVIDER shall employ citizens or residents of [source country] with appropriate training in the relevant discipline, to participate in research and training on Samples. These persons will be employed by at PROVIDER's facility either as resident researchers or, in the sole discretion of RECIPIENT, as RECIPIENT's visiting researchers.
39	COMPANY shall provide one scientist of PROVIDER, to be chosen annually by PROVIDER, with on the job training in COMPANY's drug-discovery laboratories. [details of study grant and its relationship to PROJECT.]
	COMPANY agrees to pay a royalty on a country-by-country (sic) basis on the __% of the Net Sales of any product containing a chemical entity, or prodrug or a derivative or analog thereof isolated by COMPANY from a Sample provided by PROVIDER or licensed by COMPANY under this Agreement.
	All royalties payable specifically under this Agreement (i.e., not those which are licensed to COMPANY by UNIVERSITY or FOUNDATION under other arrangements) shall be paid solely to PROVIDER. With respect to royalties payable to UNIVERSITY by COMPANY under this Agreements, UNIVERSITY and PROVIDER will be responsible for determining the actual allocation of royalties between UNIVERSITY, the inventor(s), the FOUNDATION, PROVIDER, and the [source country] government.
	If COMPANY is required to… pay royalties to an unrelated party in any country in order to make, use or sell a Covered Product, COMPANY shall be entitled to deduct those amounts from the royalties due hereunder with respect to that country, however, the aggregate of such offsets shall not reduce the royalty payable for such Covered Product for any Accounting Period (half year) by more than [specific amount or percentage] and provided further that no such deduction or offset shall be made with respect to any drug delivery system that is not necessary to the delivery of the Covered Product for its intended use or with respect to any active functional ingredient.
40	[Specified percentage] of all royalty and other considerations generated from licenses of IPR shall be equitably divided among those parties contributing intellectually to the creation of the IPR, taking into account their relative contribution and ensuring that the inventors in each case receive not less than 15% of such royalties. Notwithstanding the foregoing, the following percentages of all royalty income and other consideration generated from licenses of IPR under this agreement shall be paid or donated to the following institutions, agencies and projects [list].
42	UNIVERSITY, in collaboration with any or all cooperating organizations under the Projects of the SPONSORING AGENCY, will share royalties derived from the research, according to a scheme that has taken the following into consideration: (i) the UNIVERSITY's need to recover administrative and other costs associated with the intellectual property rights; (ii) UNIVERSITY's obligation to generate a fair return from public investment in research; (iii) the recognition of sovereign rights of source countries over their genetic resources; (iv) the need to reward and promote creative invention on the part of scientists in all Parties and all other institutions that may be involved in or related to SPONSORING AGENCY and its projects; and (v) the fundamental role of biological/chemical diversity in discovery and development of new drugs, the rapid extinction of that diversity and the need to provide financial incentive to source countries and communities who bear the costs of conserving these resources.
	The legal/policy bases of the sharing set forth above include (i) UNIVERSITY's commitment to recognizing and sharing the value and commercial revenues derived from genetic material; (ii) UNIVERSITY's policy on IPRs; (iii) the UN Convention on Biological Diversity's principles on sharing benefits from commercialized inventions; (iv) the SPONSORING AGENCY's commitment to rewarding and promoting creative invention on the Part of all scientists in collaborating projects; and (v) the provision of [particular user country law] which through implementing regulation, provides funding recipients with the first option for ownership of rights to inventions developed under federal funding.

Table 3.2.4.2b Benefit-sharing provisions (continued)

Contract No.	Monetary and non-monetary benefit-sharing
42 cont.	After reimbursement of costs associated with IPR and administration of financial provisions of the Agreement (i) 50% of the net royalty income will be transferred to a Trust Fund created under this Agreement for the purposes of making available monetary benefits derived from this research available to participating communities and to host country organizations and institutions; (ii) 20% shall be paid to UNIVERSITY, (iii) 20% to specific inventors of the drug, and (iv) 10% to other inventors SPONSORING AGENCY institutions [divided according to a particular schedule]. Other parties waive any share in royalties.
	UNIVERSITY will provide literature data to any PROVIDER COUNTRY INSTITUTION if requested.
	UNIVERSITY will train personnel of the PROVIDER COUNTRY INSTITUTIONS and other institutions specified, in the areas of expertise listed in [a related document].
	UNIVERSITY will assist in the taxonomic identification of plants collected by the PROVIDER COUNTRY INSTITUTIONS.
	PROVIDER COUNTRY INSTITUTION will share any monetary benefits that may be received as a result of the commercialization of a product derived from research and the development of compound(s) isolated from plant(s) collected in Source Country, as well as synthetic and semi-synthetic compounds whose molecular structure has been modeled or derived from the natural prototype molecule isolated from plants collected in Source Country, whether or not such plants have a history of medicinal use.
	PROVIDER COUNTRY INSTITUTION will assist in the identification of communities in Source Country who have collaborated in the research (and other organizations dealing with conservation of resources) and to suggest measures that make available to them the funds set aside from royalties received under this Agreement.
	In the event COMPANY commercializes a product derived from plant samples collected solely and exclusively under this Agreement, COMPANY agrees to return a percentage of shares of monetary benefits (royalties from net sales) to the countries of collection, the exact proportion to be determined at a later date, based on the degree of contribution of the respective PROVIDER COUNTRY INSTITUTIONS in providing the Lead Compound for development... The amount of royalty share will be negotiated in good faith between the parties and shall be calculated based on the conditions set out in this agreement. Payments of royalties will be made by COMPANY to UNIVERSITY for administration and distribution as set forth in the [undisclosed annexes] to this Agreement.
	Royalties shall only be payable to any PROVIDER COUNTRY INSTITUTION if all of the following conditions are satisfied: (i) the patent right on the COMPANY-developed compound arise solely through inventions made by Parties other than COMPANY; (ii) the Lead Compound is the same as the COMPANY-developed compound without any modification (a 'natural product drug'); and the indication for which the COMPANY-developed compound is to be developed is based on the target activity of the lead compound. No royalty payments would be due... if the lead compound originated from COMPANY's own chemical library.
	In the event of commercialisation of a product, whether based on the naturally derived or synthetically derived compounds, COMPANY shall pay such milestone payments as the Parties may in good faith agree on in accordance with royalty schedules and criteria set forth in [undisclosed annexes].
	IN the event that one or more compounds emerge which are taken forward to development by COMPANY, COMPANY agrees to invite one or more selected scientists from Source Country, for training in selected areas of scientific expertise and for terms and periods mutually to be agreed on, with the costs to be paid by COMPANY.
46	The ACCESS PARTY will provide the ACCESS PROVIDER with the benefits specified in Schedule 3.
	The ACCESS PARTY will provide the ACCESS PROVIDER with the additional benefits (if any) specified in Schedule 4. Where the access to biological resources under this Instrument leads to the discovery of new taxa, the ACCESS PARTY must offer voucher specimens for permanent loan to a public institution specified by GOVERNMENT, which is a repository of taxonomic specimens of the same order or genus as those collected. In offering voucher specimens for permanent loan, the ACCESS PARTY may set reasonable conditions for use of the loaned specimens.
	Moneys payable by the ACCESS PARTY to the ACCESS PROVIDER under this Instrument will be paid annually following delivery of Annual Reports and within 28 days following receipt of a correctly rendered tax invoice.

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Table 3.2.4.2b Benefit-sharing provisions (continued)

Contract No.	Monetary and non-monetary benefit-sharing
SMTA	In the case that the RECIPIENT commercializes a Product that is PGRFA and that incorporates Material..., and where such Product is not available without restriction [see definition of this term] to others for further research and breeding, the RECIPIENT shall pay a fixed percentage [described at section 1.4.4 of this book] of the Sales of the commercialized Product into the [FUND].
	In the case that the RECIPIENT commercializes a Product that is a Plant Genetic Resource for Food and Agriculture and that incorporates Material ...and where that Product is available without restriction [see definition of this term] to others for further research and breeding, the RECIPIENT is encouraged to make voluntary payments into the mechanism established by the GOVERNING BODY for this purpose in accordance with Annex 2 to this Agreement.
	The RECIPIENT shall make available to the Multilateral System, ... all non-confidential information that results from research and development carried out on the Material, and is encouraged to share through the Multilateral System non-monetary benefits expressly identified in ... the Treaty that result from such research and development. After the expiry or abandonment of the protection period of an intellectual property right on a Product that incorporates the Material, the RECIPIENT is encouraged to place a sample of this Product into a collection that is part of the Multilateral System, for research and breeding.*
	For these purposes, the SMTA considers 'other non-monetary benefits to be those identified in Art. 13.2 of the Treaty, under four general categories: Exchange of information, Access to and transfer of technology, Capacity-building, Sharing of ... other benefits of commercialization.

GENERAL NOTES: In providing contracts for use in this books, nearly all persons either redacted royalty amounts or asked that they should be treated as confidential. For this reason, we have decided not to reproduce these amounts in the tables. However, based upon our general evaluation of them, and without breaking confidence, we note that downstream contracts are normally more specific than ABS contracts about the royalty percentages and their calculation (see terminology, where specific relevant definitions are noted).

Typically, where a contract includes the possibility that the resources may be used in a variety of possible sectors, the royalties for use in the pharmaceutical sector are presumed to be greater than those for use in the agrichemical sector.

In some instruments, a lesser percentage was payable as to Products that were defined as 'novel patentable Products containing Company-derived modifications of [genetic resources provided] including, but not limited to improvements, chemical derivatives, and modeled analogs of such materials' – i.e., where a greater part of the use and value of the Product was attributable to the company's work than to the resource itself.

The Bonn Guidelines state that

> *Mutually agreed terms could cover the conditions, obligations, procedures, types, timing, distribution and mechanisms of benefits to be shared. These will vary depending on what is regarded as fair and equitable in light of the circumstances.*[27]

The Guidelines also state that the contract should specify the timing of and mechanisms for benefits. Both of these provisions are relatively unspecific. Rather more detail is provided regarding the forms that benefit-sharing may take, listing both monetary and non-monetary payments, and including business opportunities (the right to enter into joint ventures with the user, for example) as a monetary benefit.[28] The Guidelines' 'indicative list of typical mutually agreed terms' include: 'Provisions regarding the sharing of benefits arising from the commercial and other utilization of genetic resources and their derivatives and products'.[29]

In addition, the Guidelines suggest that the *distribution* of benefits is also an essential point for ABS contracts, suggesting that the user will make this distribution directly to communities or individuals, rather than leaving the distribution of those benefits to the discretion of the Source Country's government or designated officials.[30]

27 Bonn Guidelines at Art. 45.

28 Bonn Guidelines, Appendix II.

29 Bonn Guidelines, Art. 44.

30 There is no clear legal indication in the CBD that the CBD Parties intended to give this sovereign decision into the hands of private parties. However, many countries have reportedly done so by law or other action. *See* Swiderska, 2001.

[c] Downstream payments

Table 3.2.4.2c provides financial provisions from the 'downstream' agreements relevant to ABS – that is, the agreements between (i) a user or collection or bioprospector, and (ii) other researchers and assignees who have received genetic resources or research rights through the user. These examples describe a few of the various ways that these parties are paid in downstream contracts under licenses of genetic resources and of innovations based on genetic resources. This table is limited to the provisions in the ABS contracts reviewed for this book, and does not consider the numerous other options for such payments.

Table 3.2.4.2c Downstream payments between original collector and their assignees and other downstream users

Contract No.	Sharing material of funds with downstream users
1	In consideration for the right to commercialize the [Commercial User] shall pay the [University in Provider country] in the following compensation: A running royalty which shall be no more than 1% of the net sales value of chemical products manufactured by the [GR Developer] on the basis of natural constituent(s) selected within the Project. The royalty rate will be agreed between the parties in consideration of the situation of the market and development costs of said chemical products provided, however, that the total amount of royalties to be paid by the [Commercial User] will in no case exceed US Dollars 100'000 per year for each single compound during 10 (ten) years after commercialisation and that royalty payments will be limited to such period of time.
19	AGENCY shall distribute Net Revenues to the INSTITUTION concurrently with distributions it makes under AGENCY's patent policy on the following basis: a) _____ percent of the Net Revenues to the INSTITUTION and b) _____ percent of the Net Revenues, as a royalty to AGENCY. In addition, The INSTITUTION will pay, within sixty (60) days of the date of invoice, _____ percent of Expenses incurred by AGENCY prior to the execution date of this Agreement.
20	The INSTITUTION shall submit to AGENCY annual statements of itemized Expenses and may deduct its Recoverable Costs from any royalties due AGENCY under this Agreement, except where PHS has identified discrepancies in billing by the Institution, in which case deduction of the contested item from royalties shall be delayed pending resolution thereof
22	In consideration of the grant in Paragraph 3 above, LICENSEE hereby agrees to make the following payments to AGENCY: (a) Within 30 days of its execution of this Agreement, a non-creditable, nonrefundable license issue royalty of $_____. (b) A nonrefundable annual royalty of $_____ which shall be due and payable on January 1 of each calendar year. The annual royalty for the first calendar year of this Agreement is due and payable within 30 days from the effective date of this Agreement and may be prorated according to the fraction of the calendar year remaining between the effective date of this Agreement and the next subsequent January 1.
23	In consideration of the grant in Paragraph 3 above, LICENSEE hereby agrees to make the following payments to AGENCY (a) Within 30 days of its execution of this Agreement, a non-creditable, nonrefundable license issue royalty of $_____; (b) A nonrefundable minimum annual royalty of $_____, which shall be due and payable on January 1 of each calendar year and may be credited against earned royalties for due for sales made in that year. The minimum annual royalty for the first calendar year of this Agreement is due and payable within 30 days from the effective date of this Agreement and may be prorated according to the fraction of the calendar year remaining between the effective date of this Agreement and the next subsequent January 1; and (c) An earned royalty of ___% of Net Sales, which shall be due and payable within 60 days of the end of each calendar year.
24	In consideration of the grant of a license to investigate the suitability of the material, LICENSEE hereby agrees to pay AGENCY a royalty in the sum of U.S. $_____. Payment is due within 30 days of LICENSEE's execution of this Agreement.
	LICENSEE agrees to pay to AGENCY (1) a non-creditable, nonrefundable license issue royalty as set forth in Appendix C within thirty (30) days from the date this Agreement becomes effective; and (2)a nonrefundable annual royalty as set forth in Appendix C. The annual royalty is due and payable on the anniversary date of the effective date of this agreement of each calendar year. The first annual royalty is due and payable within 30 days from the date this Agreement becomes effective
26	No multiple royalties shall be payable where any Licensed Products or Licensed Processes are covered by more than one of the Licensed Patent Rights
	On sales of Licensed Products by LICENSEE to SUBLICENSEES or on sales made in other than an arm's-length transaction, the value of the Net Sales attributed under this Article 6 to such a transaction shall be that which would have been received in an arm's-length transaction, based on sales of like quantity and quality products on or about the time of such transaction
	LICENSEE agrees to pay AGENCY additional sublicensing royalties of ___% of the fair market value of any consideration received for granting each sublicense

It should be noted that Table 3.2.4.2c offers only a sampling of these provisions, which were numerous, and far more detailed and extensive than any of the provisions reviewed regarding payments for access and benefit-sharing between user and provider.

[d] Distribution and use of benefits

Finally, some contracts specify how the benefits will be distributed, sometimes allocating distribution responsibilities, or specifying that distribution is a joint activity, to be undertaken by the parties to the ABS contract. In some, the provisions are more conventional – payments are made by one party to the other party, and their further use and further distribution is left to that party. The relevant Bonn Guidelines provision on 'distribution and mechanisms of benefits to be shared' notes that these mechanisms 'will vary depending on what is regarded as fair and equitable in light of the circumstances.'[31] A sampling of provisions for distribution is included in Table 3.2.4.2d.

Table 3.2.4.2d Distribution of benefits

Contract No.	Distribution of benefits
12	The PROVIDER shall share all income resulting from the use, sale, transfer or license of MATERIAL or MODIFICATIONS with individuals, organizations, or communities in the country of origin, as mandated by national regulations. In the absence of said national regulations, specific terms of said income-sharing may be specified in an attachment to this Agreement, or may be negotiated at a later date, as specified herein [Parties using the form to indicate 'terms attached' or 'to be determined'].
17	The Provider and the Recipient shall share any benefits basing on either the Benefit-Sharing Formula, or Regulations or Laws of [Source Country] if so existent and applicable. In absence of the above, the PROVIDER and RECIPIENT shall enter into legally binding negotiations on best-practice method of sharing benefits. In particular, the PROVIDER shall share such income with the TRADITIONAL KNOWLEDGE PROVIDER, provided that said income derives, in whole or in part, from the contribution of the transferred intangible component of the MATERIAL provided by said TRADITIONAL KNOWLEDGE PROVIDER.
33	COLLECTOR shall use funds budgeted in clause X of this agreement… for the collection and delivery of samples
	COLLECTOR shall use any royalty payments received under this Agreement for the purposes of complying with [provisions which require (1) local consultation and environmental assessment and related processes within the 'sample area' (area in which sampling is authorised), (ii) publication of the agreement ('except for commercially sensitive terms') (iii) conservation measures planned and carried out in coordination with local communities in the sample area (iv) public education and reporting; (iv) preparation of supplemental environmental assessments regarding collection activities; (v) other measures devoted to preserving biological diversity;' and (vi) report (to the RECIPIENT) on conservation activities under this Agreement.
	PROVIDER shall cooperate with RECIPIENT to perform the following activities:
	a. Consultation with local communities, government bodies and conservation and development organizations regarding the planning and implementation of conservation measures that are compatible with and build upon local, including traditional and indigenous, cultures
	b. Public education and reporting on the Agreement and its provisions for conservation and local benefits, and the implementation of those provisions
	c. Preparation of annual environmental assessments (described elsewhere)
	d. Other measures devoted to preserving biological diversity in the Sample area.
39	With respect to royalties payable to PROVIDER by COMPANY, PROVIDER will be responsible for the actual allocation of royalties within [source country].
42	The mechanisms of making available monetary benefits derived from this Agreement to communities that collaborate in the research, to host country organizations dealing with education and the conservation of biodiversity, as well as to the host institutions, will be through a Trust Fund that will be established under a service contract with the UNIVERSITY. Disbursement of these funds will be controlled by a Board whose members will be made up of one or more representatives of UNIVERSITY, of each of the PROVIDER COUNTRY INSTITUTIONS, of INSTITUTE of the communities participating in the research. The details of this Trust Fund will be discussed and determined in the future. Aside from funds derived from the royalty stream, funds that will go into the Trust Fund may also come from other sources.

31 Bonn Guidelines at Art. 45.

Table 3.2.4.2d Distribution of benefits (continued)

Contract No.	Distribution of benefits
42 cont.	This Trust fund will be disbursed in the form of donations as compensation to indigenous communities of the Source Countries (depending on where the plant that is the source of the compound that has contributed to the research) or in the form of grants for purposes of education and training of young scientists, funding for conservation and protection of genetic resources in host countries, and in the form of funding for other conservation-related research. In recognition of COMPANY's interest in the Trust Fund, the full details of the amounts contained within it, relevant to this agreement shall be provided to COMPANY. PROVIDER COUNTRY INSTITUTION will assist in the identification of communities in Source Country who have collaborated in the research (and other organizations dealing with conservation of resources) and to suggest measures that make the Trust Fund available to them
44	There shall be established, by mutual agreement, an Environmental Trust, for the purposes of biodiversity conservation and to support sustainable uses of biodiversity, including biodiversity prospecting in the Source Country.
45	A Trust Fund shall be established in Source Country for [dollar amount] the contributions to this Fund shall be [percentage] from Source Country Government, [percentage] from User Country Government, and [percentage] from [a developed country NGO]. Its objective is to finance, on a continuing basis, investments to support the conservation of natural resources and environmental protection activities in Source Country with emphasis on [specific area].
	The recipients of grants and other support from this Fund include, but are not limited to non-governmental organizations, grass roots, community organizations, and individuals in Source Country, implementing projects and studies that promote the activities described in [another section of this Agreement.]

3.2.4.3 National procedures: PIC, MAT and other processes

Although most ABS contracts are the *product* of PIC and MAT and other processes required under national law, a few include specific requirements relating to government permit, consent and negotiation processes. The Bonn Guidelines provide a great deal of detailed suggestions relating to PIC and MAT,[32] generally, but very little regarding how those responsibilities or compliance with them should be identified in the ABS contracts themselves.[33] At Guideline 28-31, they note only that:

> *Prior informed consent for access to in situ genetic resources shall be obtained from the Contracting Party providing such resources, through its competent national authority(ies), unless otherwise determined by that Party… In accordance with national legislation, prior informed consent may be required from different levels of Government. Requirements for obtaining prior informed consent (national / provincial / local) in the provider country should therefore be specified… Respecting established legal rights of indigenous and local communities associated with the genetic resources being accessed or where traditional knowledge associated with these genetic resources is being accessed, the prior informed consent of indigenous and local communities and the approval and involvement of the holders of traditional knowledge, innovations and practices should be obtained, in accordance with their traditional practices, national access policies and subject to domestic laws... For* ex-situ *collections, prior informed consent should be obtained from the competent national authority(ies) and/or the body governing the* ex-situ *collection concerned as appropriate.*

In general, a contract will specifically discuss the PIC process only where that process is external to the contract – i.e., where national law requires both PIC and an ABS contract. Not all contracts that have been received include PIC provisions, however, even where the law includes PIC as a separate step. PIC provisions from the contracts reviewed are reproduced in Table 3.2.4.3.

32 *See*, e.g., Bonn Guideline at Arts. 16.b i., v., 28, 34 and 35

33 *See*, e.g., Bonn Guideline at Arts. 27, 37. Regarding public participation in these process generally, *e*BGs 17-21; *See* also 28 and 36. Note this is not required by the Convention, and only a 'guideline'.

Table 3.2.4.3 Provisions for PIC

Contract No.	PIC and other processes
2	USER must obtain, present and display where required under this Agreement, its authorization/registration received from the TECHNICAL OFFICE pursuant to national law. This documentation, once authenticated by the AGENCY will serve as the primary documentation of authority in all actions under this agreement, serving as a membership card for access for the Institution, which will be used to manage the access activities described in this Agreement, in the diverse projects undertaken during the use of the Agreement. USER shall, through its legal representative, communicate in writing to the TECHNICAL OFFICE any change or modification in the original conditions that existed at the time of registration, which shall be updated in the records of the TECHNICAL OFFICE, and taken into account in all activities under this Agreement which utilise this authorization. Such notices shall be communicated to the AGENCY within ten working days after the date of such modification.
	Each request for access shall include this document, accompanied by a sworn statement of the USER (prepared on an annual basis) regarding all of his permits for access, obtained in accordance with the law, for every project that USER executes. USER shall give immediate notice to the TECHNICAL OFFICE prior to any modification of the intent underlying the permit, of his bioprospecting activities or of the resulting economic advantage. USER shall fulfill the established requirements under national legislation with regard to each such change
12	Form agreement which 'is intended to both define community resource rights to samples collected on Customary Lands, including benefit sharing requirements, and to provide a written verification of Prior Informed Consent by the participating communities'
20	The parties agree that possible benefits arising from the use of repatriated materials for food and agriculture, should in the first instance be used to develop and improve the broader functions of PROVIDER and its services, which benefit the communities, the region, and the country. The mechanisms for implementing benefit sharing will be developed by mutual agreement of the parties.
31	The [Source Country's] Government, represented by the Ministry of Agriculture, approves of this collaboration and authorizes AGENCY to take all necessary action regarding the Access and Benefit-Sharing Agreement 'providing the regulations of the international conventions are adhered to'.
	AGENCY undertakes to help RECIPIENT to secure the prior informed consent of any competent national and local authorities and of any other appropriate stakeholders to enable: (a) Access to the plant material; (b) Entry upon the land in the [Source Country] on which the project activities will take place; and (c) The carrying out of the aforesaid activities.
33	PROVIDER shall ensure that Samples have been obtained from Indigenous Persons or People with their informed consent.
	In light of the widely recognized understanding that environmental assessment and local participation are essential to the preservation of biologically diverse systems, PROVIDER agrees to cooperate with RECIPIENT to conduct an annual environmental assessment for this agreement, meaning an investigation of the accumulative effects of collection activities conducted under this Agreement on the Sample Area.... The goal of the assessment shall be (1) to identify biological and cultural resources that are potentially affected; (2) identify existing laws and traditions that may affect discovery and development in the Sample area; and (gather existing information about potentially useful plant materials from people who reside in the vicinity and other experts.
	In light of the widely recognized understanding that local participation are essential to the preservation of biologically diverse systems, PROVIDER agrees to cooperate with RECIPIENT to … obtain, whenever possible, the informed consent of the appropriate representatives or governing bodies or Indigenous Peoples who traditionally reside in the Sample Area, as needed to create this agreement and to carry out activities under it. In addition, PROVIDER agrees that it will obtain, when possible informed consent to conduct activities under this Agreement from any other Local Peoples with legal authority to control access to an area in which those activities are to be conducted.
40	Confidential information obtained from non-Parties shall be protected by a confidentiality agreement, where appropriate. In particular, where a Party obtains confidential information from a source, such as a traditional healer, in a source country, then the Party must obtain an agreement providing compensation to that source for disclosing the confidential information, unless the source is a Party to this Agreement. Forms for informed consent for these activities are attached hereto as Annexes.
41	Collections made by RECIPIENT which involve the use of ethnobotanical information will be made only after the providers of such information have been informed of the use to which the information will be put and of their rights to potential benefits from such use and have given their written consent to this use and to the benefit-sharing so proposed.
42	Informed consent (collecting permits) of the [source country] government, the owner of the samples (genetic materials) and derivatives thereof, will be secured before the implementation of the work proposed as described in the project.
	PROVIDER COUNTRY INSTITUTE will seek the informed consent of individuals and/or of the communities for the recording and use of data on the medicinal and other uses of the plants in NATIONAL PARK, for intended study.
44	Any collection of material that is based on traditional knowledge will be carried out with the prior informed consent of the appropriate competent governing authorities where such a governing authority exists, and in a manner that ensures the equitable sharing of benefits that arise from traditional knowledge. Upon mutual agreement by INSTITUTE and the appropriate governing authorities of those groups offering traditional knowledge, they may participate as Collaborators. Any contribution based on traditional knowledge to any publication or intellectual property shall recognize the individuals involved.

3.2.5 Assignment, change of use, tracking and the conclusion of the ABS relationship

The question of whether the recipient of the genetic resources may assign or transfer them (whether physical samples or genetic/biochemical information and research results) to another party has been a very difficult problem for ABS, both in regime negotiations and in the contracts themselves. It is integrally linked to other questions, such as tracking of genetic resources (sometimes proposed as a way to determined whether genetic resources have changed hands) and derivatives – a concept that addresses how far into the use/production process the ABS responsibilities extend.

In international and national law development, assignment-related concerns have centered on how to define the rights of provider, user and their respective countries. Another issue which has raised controversy is whether exceptions should be granted for particular transfers or particular users. In contracts, the problem to be faced is how to clarify exactly what kinds of transfers are permissible and exactly what the parties must do in the event of transfer.

Regarding these linked issues (assignment, change of use and derivatives) the Bonn Guidelines give relatively limited guidance, noting that ABS contracts or MAT should include:

(1) a 'statement that any change of use would require new prior informed consent and material transfer agreement;'[34]

(2) clarification regarding 'whether the genetic resources and/or accompanying information may be transferred to third parties and if so conditions that should apply;'[35]

(3) legal provisions regarding 'assignment or transfer of rights;'[36] and

(4) legal provisions regarding assignment, transfer or exclusion of the right to claim any property rights, including intellectual property rights, over the genetic resources received through the material transfer agreement.'[37]

It is not entirely clear what the difference between these provisions might be, if any.

In addition to these, the Guidelines' 'indicative list of typical mutually agreed terms' includes the following:

- a clause on whether the terms of the agreement in certain circumstances (e.g. change of use) can be renegotiated;

- [a clause stating] *whether the genetic resources can be transferred to third parties and conditions to be imposed in such cases,* e.g. *whether or not to pass genetic resources to third parties without ensuring that the third parties enter into similar agreements except for taxonomic and systematic research that is not related to commercialization… and*

- provisions regarding the sharing of benefits arising from the commercial and other utilization of genetic resources and their derivatives and products.[38]

The following sections separately discuss and provide tables of provisions for assignment/transfer, change of use and derivatives.

3.2.5.1 Assignment and transfer provisions

Table 3.2.5.1 provides examples of direct provisions discussing the transfer or assignment.

34 Bonn Guidelines, Appendix I, clause B.3.
35 Bonn Guidelines, Appendix I, clause B.7.
36 Bonn Guidelines, Appendix I, clause C.8
37 Bonn Guidelines, Appendix I, clause C.9
38 Bonn Guidelines, Arts. 44e, f and i.

Table 3.2.5.1 Assignment and/or transfer

Contract No.	Assignments and transfers of genetic resources
2	'INTERESTED PARTY' shall not transfer any part of the original material to third parties, nor undertake or allow duplication of the material for or by such parties, except where first obtaining written authorization of 'SUPPLIER'. Should any third party be interested in the material, such party shall be equally bound by the terms established in the present agreement between 'SUPPLIER' and the original 'INTERESTED PARTY'.
4	The LICENSEE will not assign the whole or any part of this License Agreement without the prior written consent of LICENSOR, which consent will not be unreasonably withheld. It will not be unreasonable for LICENSOR to refuse to consent to any assignment, if it is foreseeable that the assignment might negatively affect LICENSOR in any way or derogate from the commercialization of the any new variety developed under this License Agreement. Consent to any assignment will not be construed as consent to any other assignment. Failure of the LICENSEE to obtain the prior written consent of LICENSOR to any assignment shall be deemed to be a breach of this License Agreement.
	The LICENSEE shall not have the right to grant written royalty-bearing sub-licenses within the Territory covered by this Agreement for the use or purposes of development of products based on [specified genetic strain]. If the LICENSEE wishes to sub-license, the LICENSEE must consult with LICENSOR and obtain the right to grant a sub-license according to terms agreed to both Parties. Except that The LICENSEE will be always be granted permission to sub-license any new plant variety based on the any variety which the LICENSEE created pursuant to this License Agreement. Whenever given permission to sub-license, the LICENSEE shall pass on all obligations of this License to the sub-licensee, especially the requirement of royalties paid for [specified genetic strain]'s inclusion in any variety sold by the sub-licensee.
	The LICENSEE shall not apply for any patent or other right and shall not divulge or disclose, without the prior written consent of LICENSOR, any information, material or documents concerning same or make available in any way or use [specified genetic strain] except as expressly provided in this License Agreement, in a breeding program of the LICENSEE to produce one ore more varieties for the use of the LICENSEE.
5	DATA-OWNER has transferred the GENETIC INFORMATION to DATABASE HOLDER:. The [Partnership] Program Manager will only allow Member Institutions which are signatories to this Agreement to have access to the GENETIC INFORMATION. DATA-OWNER will pay all expenses to transfer 'GENETIC INFORMATION' to DATABASE HOLDER. After the receipt of the "GENETIC INFORMATION' by DATABASE HOLDER, DATABASE HOLDER will pay all expense to store and manage the 'GENETIC INFORMATION'. ...
	Results obtained from accessing the 'GENETIC INFORMATION' will be communicated specifically to the e-mail account identified by the PRINCIPAL INVESTIGATOR. ...
	It may be possible that some of the data and/or equivalent materials in the 'GENETIC INFORMATION' may also be obtained by the Principal Investigator or Project Participants from public sources. Such users of the 'GENETIC INFORMATION' are encouraged to search alternate databases prior to their use of the 'GENETIC INFORMATION'. DATA-OWNER will not undertake a survey of which materials were available elsewhere (or when they were available). All uses, search results and analyses obtained from the 'GENETIC INFORMATION', whether available from public sources or not, are subject to the terms of this Agreement.
11	The Sponsor grants the University a royalty-free, non-exclusive licence to use the Results for the purpose of carrying out the Project, but for no other purpose. The University may not grant any sub-licence to use the Results.
12	This Agreement ... allows research use on the transferred germplasm. It also allows third-party transfers to multilateral agricultural research organizations. [Stating no limit or notice requirements with regard to these transfers. For this purpose, it specially defines one class of such institutions – CGIAR System]
	The RECIPIENT and the RECIPIENT SCIENTIST agree to refer to the PROVIDER any request for the MATERIAL from anyone other than those persons working under the RECIPIENT SCIENTIST's direct supervision. To the extent supplies are available, the PROVIDER or the PROVIDER SCIENTIST agrees to make the MATERIAL available, under a separate agreement having terms consistent with the terms of this Agreement, to other scientists (at least those at NONPROFIT ORGANIZATION(S)) who wish to replicate the RECIPIENT SCIENTIST's research; provided that such other scientists reimburse the PROVIDER for any costs relating to the preparation and distribution of the MATERIAL
	RECIPIENT may, under a separate agreement having terms as protective of the PROVIDER's rights as this Agreement, distribute MODIFICATIONS to NONPROFIT ORGANIZATION(S) for research and teaching purposes only.
	RECIPIENT may not, without written consent from the PROVIDER, provide MODIFICATIONS for COMMERCIAL PURPOSES. Such COMMERCIAL PURPOSES may require a commercial licence from the PROVIDER, and the PROVIDER has no obligation to grant a commercial licence to its ownership interest in the MATERIAL incorporated in the MODIFICATIONS.
	The sole exception to [provision forbidding any transfer for commercial purposes] shall be in the case of the distribution of MATERIAL or MODIFICATIONS to the CGIAR SYSTEM. Provided that the RECIPIENT obtains written consent from the PROVIDER, the RECIPIENT may distribute MATERIAL or MODIFICATIONS to the CGIAR SYSTEM for multiplication and dissemination. Said distribution shall be in accord with prevailing rules and regulations of the CGIAR SYSTEM.

Table 3.2.5.1 Assignment and/or transfer (continued)

Contract No.	Assignments and transfers of genetic resources
14	Transfer to third parties is allowed, but the Recipient is required to sign contractual agreements with each third party that preserves the original Provider's rights and in either case with the written consent of the original Provider.
15	Transfer to third parties is allowed with prior consent of the original Provider. Patenting of research results is allowed, as are commercial uses, however the RECIPIENT is required to negotiate a revenue-sharing agreement with the PROVIDER..
19	This Agreement is binding upon and shall inure to the benefit of the parties hereto, their successors or assigns, but this Agreement may not be assigned by either party without the prior written consent of the other party.
20	LICENSEE agrees to retain control over the Materials, and not to distribute them to third parties without the prior written consent of AGENCY LICENSEE agrees that this Agreement does not preclude AGENCY from distributing the Materials to third parties for research or commercial purposes.
	Notwithstanding any other provision herein, the INSTITUTION shall not issue any royalty-free or paid-up licenses or assign patent rights to any third party, without the prior written consent of AGENCY.
22	LICENSEE agrees that this Agreement does not preclude AGENCY from distributing the Materials to third parties for research or commercial purposes
23	LICENSEE agrees to retain control over the Materials, and not to distribute them to third parties without the prior written consent of AGENCY except as otherwise permitted in this Agreement
25	LICENSEE has no right to grant sublicenses. This Agreement confers no license or rights by implication, estoppel, or otherwise under any patent applications other than the Licensed Patent Rights granted herein, regardless of whether such patents are dominant or subordinate to Licensed Patent Rights
	This Agreement shall not be assigned by LICENSEE except a) with the prior written consent of AGENCY or b) as part of a sale or transfer of substantially the entire business of LICENSEE relating to operations which concern this Agreement
26	Upon written approval by AGENCY which approval will not be unreasonably withheld, LICENSEE may enter into sublicensing agreements, so long as such sublicenses require that the obligations to AGENCY under this Agreement shall be binding upon the sublicensee as if it were a party to this Agreement. Licensee shall attach copies of this Paragraph to all sublicense agreements. Upon termination of this agreement, any sublicense shall provide be terminated or converted to a license directly between such sublicensees and AGENCY, if desired by SUBLICENSEE, and agreed by AGENCY. LICENSEE shall forward to AGENCY a copy of each such sublicense, postmarked within thirty (30) days of the execution of such agreement. To the extent permitted by law, AGENCY shall maintain each such sublicense agreement in confidence
	This Agreement shall not be assigned by LICENSEE except: a) with the prior written consent of AGENCY, such consent not to be withheld unreasonably; or b) as part of a sale or transfer of substantially the entire business of LICENSEE relating to operations which concern this Agreement. LICENSEE shall notify AGENCY within ten (10) days of any assignment of this Agreement, and Licensee shall pay AGENCY, as an additional royalty, one percent (1%) of the fair market value of any consideration received for any assignment of this Agreement within thirty (30) days of such assignment.
28	RECIPIENT agrees not to distribute or transfer samples of the MATERIAL or its derivatives to any other country/party except those directly engaged in research under our supervision, without Written Prior Approval from PROVIDER.
30	The RECIPIENT's rights under this agreement are not assignable, Specifically, the RECIPIENT must not, without the prior written permission of PROVIDER: (a) sell, loan, or otherwise provide the Materials or the Results to any third party; ... or (c) use or store the Materials in any location other than in the laboratory of the Lead Investigator and under his or her direct supervision (or delegate).
	The RECIPIENT will use reasonable effort to notify PROVIDER as soon as possible of any inquiries for commercial purposes received from a third party regarding rights in, or use, copying, or distribution of Results published or publicly disclosed in accordance with this Agreement.
31	COLLECTION may supply any of the seeds and associated herbarium specimens, their progeny or derivatives.
39	PROVIDER may subcontract with other institutions for all or part of the preparation of Samples, and shall be responsible for supervising the activities of such subcontractors. Subcontracts shall be consistent with the terms of this Agreement and shall require the subcontractor to assign all intellectual property rights to PROVIDER. Any amounts paid to subcontractors for their service or efforts shall be solely a matter between PROVIDER and subcontractor. COMPANY shall have no obligation or liability with regard to any or all such services or efforts.
40	The Parties agree that any Natural Material discovered pursuant to this Agreement or the Scope of Work given to entities not a party to this Agreement shall only be provided by consent of the INSTITUTE.
	The Parties agree that any Proprietary Information Furnished under this Agreement to another party, or in contemplation of this agreement shall be used reproduced and disclosed only for the purposes of carrying out this Agreement and shall not be released outside of signatory parties to this Agreement, unless consent to such release is made by all parties. Proprietary Information may be released as necessary to [government agency]

continued on next page

Table 3.2.5.1 Assignment and/or transfer (continued)

Contract No.	Assignments and transfers of genetic resources
40 cont.	Where it is not possible to protect IPR in Natural Materials or related information under this Agreement, the Parties will attempt to protect them by means of contractual arrangements with the persons providing access for collection of those materials or information. Such arrangements may provide payments for the provision of access to particular habitats, with special consideration to the rights of indigenous or local people.
	All licenses and transfers granted on any IPR under this Agreement shall contain a clause referring to this Agreement and stating that the licensee or transferee under this has been apprised of this Agreement.
41	PROVIDER agrees that it will not make Extracts available to any third party without prior written consent from RECIPIENT. RECIPIENT agrees that any Extract received from PROVIDER shall not have been previously provided to any third party to test for potential use, unless it first notifies COMPANY in writing to the contrary and indicates to whom such Extract has been provided.
	RECIPIENT will not authorise PROVIDER to transfer such Extract to any third party to test for any use until if first receives a notice from COMPANY and from PROVIDER that they have no continuing interest in the Extract.
45	Rights granted under this Agreement are assignable to affiliates of COMPANY.
46	The ACCESS PARTY will not transfer, deliver or provide access to Samples or Products; or transfer, assign or grant rights (including Intellectual Property) in Samples or Products, to a third party unless it does so under an agreement on proper terms, consistent with this Instrument, which would normally be contained in a contract, agreement or transaction between persons dealing with each other at arms length and from positions of comparable bargaining power; or the third party has entered into an agreement with the ACCESS PROVIDER, or provided an enforceable undertaking to the ACCESS PROVIDER, to provide the ACCESS PROVIDER with the benefits and to comply with the requirements of this provision.
	In the latter event, such agreement must ensure that the ACCESS PROVIDER will continue to receive an equitable share of the benefits arising from subsequent use of the Samples or Products, or the rights in those Samples or Products by the third party and any subsequent parties. Such an agreement must include an undertaking not to carry out, or allow others to use the Material for commercial purposes unless a benefit-sharing agreement has been entered into with the ACCESS PARTY
	The ACCESS PARTY must provide the ACCESS PROVIDER with the name of each third party that an agreement is made with and details of the terms of the agreement.
SMTA	In the case that the RECIPIENT conserves the Material supplied, the RECIPIENT shall make the Material, and the related information referred to in Article 5b, available to the Multilateral System using the Standard Material Transfer Agreement
	In the case that the RECIPIENT transfers the Material supplied under this Agreement to another person or entity (hereinafter referred to as 'the subsequent recipient'), the RECIPIENT shall a) do so under the terms and conditions of the Standard Material Transfer Agreement, through a new material transfer agreement; and b) notify the GOVERNING BODY, in accordance with Article 5e.On compliance with the above, the RECIPIENT shall have no further obligations regarding the actions of the subsequent recipient
	In the case that the RECIPIENT transfers a Plant Genetic Resource for Food and Agriculture under Development to another person or entity, the RECIPIENT shall: a) do so under the terms and conditions of the Standard Material Transfer Agreement, through a new material transfer agreement, provided that Article 5a of the Standard Material Transfer Agreement shall not apply; b) identify, in Annex 1 to the new material transfer agreement, the Material received from the Multilateral System, and specify that the Plant Genetic Resources for Food and Agriculture under Development being transferred are derived from the Material; c) notify the GOVERNING BODY; and d) have no further obligations regarding the actions of any subsequent recipient.
	Entering into a material transfer agreement [with another party, to whom the Material is assigned] shall be without prejudice to the right of the parties [to that subsequent transfer] to attach additional conditions, relating to further product development, including, as appropriate, the payment of monetary consideration [between the parties to that subsequent transfer.]
	A RECIPIENT who obtains intellectual property rights on any Products developed from the Material or its components, obtained from the Multilateral System, and assigns such intellectual property rights to a third party, shall transfer the benefit-sharing obligations of this Agreement to that third party

3.2.5.2 Change of use

Regarding change of use issues, the Bonn Guidelines are uncharacteristically specific, stating that

> *Prior informed consent should be based on the specific uses for which consent has been granted. While prior informed consent may be granted initially for specific use(s), any change of use, including transfer to third parties may require a new application for prior informed consent. Permitted uses should be clearly stipulated and further prior informed consent for changes or unforeseen uses should be required.*[39]

Table 3.2.5.2 includes direct provisions regarding change of use. As shown by these provisions, the strong language of the Bonn Guidelines on this issue has not been taken to heart in all contracts.

Table 3.2.5.2 Change of use

Contract No.	Change of use
2	'SUPPLIER' shall transfer material to ' INTERESTED PARTY,' which material shall be used exclusively for aims of: _[list]__ In the project entitled ___[name]_____; whose Principle Investigator is ____[name and identification]_____, and which seeks to achieve the following objective: ___[specify]_____. The material cannot be used for any objective or purpose other than the one described in this paragraph, unless the ' INTERESTED PARTY ' shall first receive authorization from 'SUPPLIER'.
11	If the RECIPIENT desires to use or license the MATERIAL or MODIFICATIONS for COMMERCIAL PURPOSES, the RECIPIENT agrees, in advance of such use, to negotiate in good faith with the PROVIDER to establish the terms of a commercial licence. It is understood by the RECIPIENT that the PROVIDER shall have no obligation to grant such a licence to the RECIPIENT, and may grant exclusive or non-exclusive commercial licences to others, or sell or assign all or part of the rights in the MATERIAL to any third party(ies), subject to any pre-existing rights held by others and obligations to the PROVIDER'S Government. The Provider and the Recipient shall share any benefits basing on the Benefit-Sharing Formula, Regulations or Laws of [Source Country] if so existent and applicable. In absence of the above, the PROVIDER and RECIPIENT shall enter into legally binding negotiations on best-practice method of sharing benefits.
	The RECIPIENT and the RECIPIENT SCIENTIST agree to refer to the PROVIDER any request for the MATERIAL from anyone other than those persons working under the RECIPIENT SCIENTIST's direct supervision. To the extent supplies are available, the PROVIDER or the PROVIDER SCIENTIST agrees to make the MATERIAL available, under a separate agreement having terms consistent with the terms of this Agreement, to other scientists (at least those at NONPROFIT ORGANIZATION(S)) who wish to replicate the RECIPIENT SCIENTIST's research; provided that such other scientists reimburse the PROVIDER for any costs relating to the preparation and distribution of the MATERIAL.
14	RECIPIENT and RECIPIENT SCIENTIST agree that use of MATERIAL or MODIFICATIONS for COMMERCIAL PURPOSES other than those specified in 3 (a) shall require written consent of the PROVIDER.
30	The RECIPIENT must not, without the prior written permission of PROVIDER... use the Materials or the Results for any purpose other than the Approved Research).
	If the RECIPIENT wishes to commercialize or have commercialized any Results or Intellectual Property arising from its use of the Materials, including intellectual property protection, it must first enter into an appropriate agreement with PROVIDER with the understanding that PROVIDER agrees to negotiate non-exclusively in good faith with a view to concluding such an agreement on terms acceptable to the parties
32	If commercial breeding is planned, the LICENSEE shall first inform the LICENSOR in writing, and negotiate and execute an additional contract for that use.
40	If at any time the [individuals named as focal points for each of the parties] determine that the research data dictates a substantial change in the direction of the work, the Parties shall make a good0fait effort to agree on any necessary change to the scope of work by written instrument, signed by all Parties whose rights or duties are affected by the change, only after consultation with and approval of the INSTITUTE and the SPONSORING PROJECT.

39 Bonn Guidelines, Art. 34. It goes further in noting that 'Specific needs of taxonomic and systematic research as specified by the Global Taxonomy Initiative should be taken into consideration.'

3.2.5.3 Derivatives

Table 3.2.5.3 includes a few provisions regarding derivatives and derivative products, given that the transfer of these may or may not (depending on definitions and other factors) constitute either an assignment or change of use under the ABS contract.

Table 3.2.5.3 Derivatives

Contract No.	Derivatives
4	The LICENSEE agrees that [specific genetic strain], its creation, discovery, development and every matter relating thereto, forming part thereof and arising therefrom are vested in and are the sole property of LICENSOR.
12	The RECIPIENT and/or the RECIPIENT SCIENTIST shall have the right, without restriction, to distribute substances created by the RECIPIENT through the use of the ORIGINAL MATERIAL only if those substances are not PROGENY, UNMODIFIED DERIVATIVES, or MODIFICATIONS
13	The RECIPIENT retains ownership of: (a) MODIFICATIONS (except for ownership rights to the MATERIAL included therein as in 1), and (b) those substances created through the use of the MATERIAL or MODIFICATIONS, but which are not PROGENY, UNMODIFIED DERIVATIVES or MODIFICATIONS (i.e., do not contain the ORIGINAL MATERIAL, PROGENY, UNMODIFIED DERIVATIVES). If either 2 (a) or 2 (b) results from the collaborative efforts of the PROVIDER and the RECIPIENT, joint ownership may be negotiated.
22	With this Agreement, AGENCY grants to LICENSEE a worldwide, non-exclusive license to make, have made, use, but not to sell the Materials. For this purpose, 'Materials' [covered under this Agreement] means the following biological materials including all progeny, subclones, and derivatives thereof: [specific specimens, species and varieties described in detail by parties using the form], as described in _[to be filled in by parties]__ and developed in the laboratory of ___[inventor]___.
28	RECIPIENT agrees not to distribute or transfer samples of the MATERIAL or its derivatives to any other country/party except those directly engaged in research under our supervision, without Written Prior Approval from PROVIDER.
30	The RECIPIENT must only use the Materials and Results for the Approved (taxonomic and geonomic) Research in accordance with the Access Proposal (prepared under this Agreement), and must not make Derivatives from the Materials
	Nothing in this Agreement prevents PROVIDER from exploiting the Materials, the Results or any other modifications or Derivatives developed pursuant to permission or other agreement), and distributing those Materials, or any other modification or derivatives to any third party, including both profit and non-profit organizations.
31	COLLECTION may supply any of the seeds and associated herbarium specimens, their progeny or derivatives.
	[*See* also Table 3.2.3]

3.2.6 Tracking

Fewer than 5% of the contracts reviewed made any reference to the post-contract tracking or specific oversight regarding the movement of the genetic resources that have been transferred. The only reproducible provisions regarding this point are set out in Table 3.2.6.

Table 3.2.6 Tracking

Contract No.	Tracking
2	'INTERESTED PARTY' will assign an identification system to all the obtained material of the 'SUPPLIER', to enable observable control of the [identity of] the transferred material
32	The LICENSEE must not reproduce plants without first obtaining a special license from the LICENSOR
SMTA	Access shall be accorded expeditiously, without the need to track individual accessions and free of charge, or, when a fee is charged, it shall not exceed the minimal cost involved

It would not be fair to castigate other contracts for their failure to address tracking/tracing issues. In fact, this is not an omission but an alternative approach, used in instruments in which contract parties presume that all movement of genetic resources can be tracked or overseen, and/or that it may be legally and physically impossible to verify or confirm that a party who is required to track genetic resources is complying as required.[40]

3.2.7 Intellectual property and other intangible properties

The controversial issue of IPRs in biologically derived innovations and discoveries has become intrinsically intertwined in the ABS discussions. It has been the subject of intensive research, analysis and international discussions.[41] In contracts, however, these matters are relatively clear. IPRs and other intangible rights are not, *per se,* inconsistent with ABS, given that they are a primary method by which genetic resources are converted to 'benefits' – and the sharing of benefits is a primary objective of ABS. Consequently, the contractual provisions regarding the parties' rights in the event that an IPR is sought or obtained, the transfer of those rights, and the maintenance of confidentiality are relatively straightforward.

IPR issues in contracts are somewhat complex – frequently the most complex provisions in the contract. For this reason, and because the uncertainties generally present in ABS are also relevant to IPR and intangible rights, this book includes examples of a number of the different ways that ABS contracts address IPR and other intangible rights.

The Bonn Guidelines include a number of other intellectual-property related provisions and recommendations, including, for example, statements that

> *Contracting Parties which are countries of origin of genetic resources, or other Parties which have acquired the genetic resources in accordance with the Convention should… Seek to ensure that the commercialization and any other use of genetic resources should not prevent traditional use of genetic resources;*[42]
>
> *Mutually Agreed Terms should address… whether intellectual property rights may be sought and if so under what conditions.*[43]

They also suggest that MAT could include

> *Provision for the use of intellectual property rights include joint research, obligation to implement rights on inventions obtained and to provide licences by common consent; and the possibility of joint ownership of intellectual property rights according to the degree of contribution.*[44]

Fortunately, IPR law has existed for approximately 150 years, and is very detailed in addressing a great many different contractual options. Thus, it provides useful examples and applications.

3.2.7.1 IPRs

Normally, when a contract specifically discusses IPR issues, it will do so in a series of linked provisions. Table 3.2.7.1 includes the parties' rights to the 'information' that is inherent in genetic resources and their use.

40 See, Ruiz and Lapeña, 2007.

41 Among this plethora of material, some of the most useful in depth studies on IPRs and ABS include WIPO, 2004 (and several others); Dutfield, 2002; Oldham, 2004; and Tvedt 2005.

42 Bonn Guidelines, Art. 16.iii.

43 Bonn Guidelines, Appendix I, clause B. 4.

44 Bonn Guidelines, Arts. 43.c and d.

Table 3.2.7.1a General provisions regarding genetic resources as information

Contract No.	Rights and duties in genetic information
1	Extracts/Plants that are either inactive or uninteresting for the COMPANY shall, upon the COMPANY's declaration thereof, be at the UNIVERSITY's free disposal and shall then no longer be covered by this Agreement.
2	INTERESTED PARTY assumes all responsibility to observe the rules and requirements governing the movement of any material from any country to any country and through any countries in transit.
4	The LICENSEE agrees that the Genetic Strain, its creation, discovery, development and every matter relating thereto, forming part thereof and arising therefrom are vested in and are the sole property of LICENSOR
5	The GENETIC INFORMATION provided to the database is the confidential property of DATA-OWNER providing that information and/or material. …. By accessing that GENETIC INFORMATION, all PARTNERS using this database agree that any inventions, discoveries, or other intellectual property discovered, conceived, or reduced to practice and resulting from the use of that information or material shall be subject to the terms of this Article. Ownership of any patents, copyrights, processes, inventions and other proprietary intellectual property of any nature conceived or reduced to practice in performance of the research under this Agreement shall vest in the PARTNER whose work gave rise to that patent or other rights. Except as provided for in this Agreement, the PARTNER shall have the right to use it for any commercial purposes.
7	This Agreement does not affect the ownership of any Intellectual Property in any Background or in any other technology, design, work, invention, software, data, technique, Know-how, or materials that are not directly results of the Research. No license to use any Intellectual Property is granted or implied by this Agreement except the rights expressly granted in this Agreement.
12	The PROVIDER retains ownership of the MATERIAL, including any MATERIAL contained or incorporated in MODIFICATIONS.
	The RECIPIENT retains ownership of: (a) MODIFICATIONS (except for ownership rights to the MATERIAL included therein as in 1), and (b) those substances created through the use of the MATERIAL or MODIFICATIONS, but which are not PROGENY, UNMODIFIED DERIVATIVES or MODIFICATIONS (i.e., do not contain the ORIGINAL MATERIAL, PROGENY, UNMODIFIED DERIVATIVES). If either 2 (a) or 2 (b) results from the collaborative efforts of the PROVIDER and the RECIPIENT, joint ownership may be negotiated.
19	The INSTITUTION hereby grants and AGENCY accepts, subject to the terms and conditions of this Agreement, an exclusive license including the right to sublicense, under the 'Patent Rights' herein defined to make and have made, to use and have used, to sell and have sold, to offer to sell, and to import any tangible embodiment of the Patent Rights and to practice and have practiced any process(es) included within the Patent Rights. The GOVERNMENT shall have the irrevocable, royalty-free right worldwide to practice and have practiced the Patent Rights for or on behalf of the GOVERNMENT and on behalf of any foreign government or international organization under any existing or future treaty or agreement with the GOVERNMENT.
	AGENCY shall diligently seek licensee(s) for the commercial development of the Patent Rights and shall administer them for the mutual benefit of the parties and in the public interest. AGENCY shall promptly provide to the INSTITUTION copies of all licenses and sublicenses issued on Patent Rights.
20	The INSTITUTION shall diligently seek licensee(s) for the commercial development of Patent Rights, as defined herein, and shall administer the Patent Rights for the mutual benefit of the parties and in the public interest. The INSTITUTION will ensure that any license granted on Patent Rights is subject to the provisions of [specific national law] and other rights retained by the GOVERNMENT under this Agreement, including the requirement for substantial manufacture.
	The INSTITUTION shall consult with the AGENCY in the negotiation of any exclusive or partially-exclusive licenses, not withstanding any other provision of this Agreement, and shall not issue such licenses without the prior review, opportunity for comment, and written consent of AGENCY. Before licensing of the Patent Rights or any part thereof by the INSTITUTION the INSTITUTION shall first notify and confer with AGENCY regarding any research funding related to the Patent Rights so as to determine AGENCY's interest in participating in any such funded collaborative research project. The INSTITUTION shall promptly provide to AGENCY copies of all licenses and sublicenses issued on Patent Rights.
25	AGENCY offers no warranties other than those expressly specified in this Agreement. In particular, AGENCY does not warrant the validity of the Licensed Patent Rights and makes no representations whatsoever with regard to the scope of the Licensed Patent Rights, or that the Licensed Patent Rights may be exploited without infringing other patents or other intellectual property rights of third parties. AGENCY specifically does not represent that it will commence legal actions against third parties infringing the Licensed Patent Rights
30	All property rights in and in relation to the Materials and the Results, including Intellectual Property arising (directly or indirectly) from the RECIPIENT's use of the Materials or the Results vests, or will vest, in PROVIDER. In addition (without limiting the foregoing) all Intellectual Property rights arising from use of the Materials, the Results or any Derivative other than for the Approved Research, or from any other breach of this agreement by the Recipient, will vest in PROVIDER

Table 3.2.7.1a General provisions regarding genetic resources as information (continued)

Contract No.	Rights and duties in genetic information
35	TRANSFEROR hereby grants to COMPANY the exclusive option, exercisable as specified below, to acquire a worldwide exclusive license under any Patent to make, have made use and sell any sample compound (including synthetic chemical derivatives thereof) or Product for agrichemical and biomedical applications. This option shall be exercisable by COMPANY at any time within one year following the date COMPANY first has knowledge of the purification, identity, isolation or characterization of a particular Sample Compound. If the COMPANY exercises this option, the terms under which COMPANY may develop, manufacture and market a PRODUCT shall be set for in separate license agreements to be negotiated in good faith within 6 months after COMPANY gives notice of its intent to exercise this option.
	Any such license agreement shall contain customary terms for marketing and sales efforts, termination, diligence, patent infringements, audit, indemnity and publication. Such agreement shall include specifically (i) [schedule of royalties], (ii)- (vii) [specified provisions mandating patent prosecution and sharing its costs], reference to TRANSFEROR's agreements with collector and/or extractor [provider in source country], (viii) terms requiring payment to groups and individuals in the Country of Collection who have provided Samples and information regarding Samples, so long as such payments are in accordance with pertinent industry standards and commensurate with the actual contribution of such groups or individuals; (x) terms requiring the COMPANY to negotiate in good faith with the Collector and or Extractor in a particular Country of Collection to establish such Collector and or Extractor as its first source of supply of the raw material, or if the Collector and or Extractor cannot provide adequate amounts due to potential deforestation, to provide financial assistance to commence the commercial cultivation of a particular species or sponsor other appropriate conservation measures for the species....
	In the event that any invention is discovered by COMPANY based on materials provided under this Agreement, [any future license agreement regarding that invention shall include] a reduction in the royalties payable, acceptable to COMPANY and the Collection/Extractor (provider) in the Country of Collection or to COMPANY, TRANSFEROR, which makes appropriate recognition of the contribution of the parties.
	If Company-derived modifications of Sample Compounds are invented solely by COMPANY, then they shall be owned solely by COMPANY, subject to the obligation to pay royalties under this Agreement.
	The license-related responsibilities to Collector/Extractor or Country of Collection, as described above, shall not apply to license agreements regarding Sample Compounds from plant species which are freely available from different countries (e.g., common weeds, agricultural crops, ornamental plants) unless information indicating a particular (medicinal or pesticidal) use of the plant species was provided by local residents to guide the collection of such plant from the particular Country of Collection or unless other justification acceptable to both Collector/Extractor/Country-of-Collection and TRANSFEROR is provided in the case where a plant is freely available from different countries, but a genotype producing an active agent is found only in a particular Country of Collection.
39	In the event that COMPANY notifies PROVIDER (see reporting) that a Sample is 'active', COMPANY shall have [time period] during which to pursue commercial development of that active extract. All development, marketing and other commercialisation decisions with respect to any product that COMPANY may develop from related to or connected with a Sample shall be determined by COMPANY in its sole discretion.
	Each Party hereto agrees to report any and all patentable inventions made in the course of the research to each other party. Each Party shall have the first right to patent applications covering any inventions of which it is the sole owner under this Agreement. If a party elects not to file a patent application, it will notify COMPANY which shall thereafter have a right to file for such invention, at COMPANY's expense, but in the name of such solely owning party. In the event that COMPANY elects not to file an application as to its solely owned inventions, it shall notify PROVIDER and FOUNDATION who shall have the right to file, as above.
40	'Intellectual Property Rights of the PROJECT' means any and all rights relating to Natural Products discovered, obtained or invented in the course of activities of the Parties in furtherance of this Agreement and includes but is not limited to, for example, utility patents, plant breeder patents, petty patents, trade secrets, copyright, trademark as well as any other statutory or common law, or traditional rights, other than real property and personal property, which may be obtained or enforced in any legal jurisdiction of the world.
	Each Party shall arrange for its employees and agents to report all IPR to that Party, and to identify all Natural Materials involved and the source of each Natural Material. The Parties shall promptly report to the [designated coordinator] all IPR reported to them under this paragraph.
41	Each Party will report all Subject Inventions executed in the course of the work carried out under this Agreement to the designated person in each other Party. After receipt of such notice, INSTITUTE shall be responsible to report all Subject Inventions to the SPONSORING AGENCY. Such reporting shall include timely notification to the SPONSORING AGENCY of any Party's election to retain title to any Subject Invention. The SPONSORING AGENCY shall also be notified when all Parties in tern have had the opportunity to exercise this option to retain and has declined.

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Table 3.2.7.1a General provisions regarding genetic resources as information (continued)

Contract No.	Rights and duties in genetic information
42	In the event that an invention or discovery is made at UNIVERSITY on plants collected or acquired within SPONSORING AGENCY, UNIVERSITY, through its Intellectual Property office will determine the ownership of any resulting intellectual property with the assistance of all Parties to this Agreement. The named inventors.... will depend on the Parties respective contribution to any particular invention or discovery. The question of ownership shall be determined in accordance with applicable law in the country in which any invention or discovery is made. UNIVERSITY will obtain patent protection for such invention or discovery and/or seek such other intellectual property protection as it shall deem appropriate, after input from all other Parties, UNIVERSITY will be responsible for the management and licensing of such inventions and discoveries in accordance with the terms of this Agreements.
	COMPANY will have the rights to file for patent protection for a discovery it makes that is base on plant samples or extracts received by COMPANY, but will consult with the Parties in determining co-inventorship of such discovery, before filing for patent rights on any invention associated with plants acquired under this Agreement.
46	In this instrument, unless the context indicates otherwise,
	'Intellectual Property' includes (a) copyright; (b) all rights in relation to inventions (including patent rights), (c) all rights in relation to plant varieties (including plant breeders rights); (d) registered and unregistered trademarks (including service marks), designs, and circuit layouts, (e) know-how (whether patentable or not); and (f) all other rights resulting from intellectual activity;
	As between the ACCESS PROVIDER and the ACCESS PARTY (but without affecting the position between the ACCESS PARTY and a third party) Intellectual Property arising from R&D Activity is vested or will vest in the ACCESS PARTY
	The ACCESS PARTY may grant third parties the right to exploit the Intellectual Property arising from R&D Activity
SMTA	Access to Plant Genetic Resources for Food and Agriculture protected by intellectual and other property rights shall be consistent with relevant international agreements, and with relevant national laws;

A second set of provisions discuss the particular rights of one or both parties with regard to IPRs. A variety of examples of this type of provision can be found in Table 3.2.7.1b.

Table 3.2.7.1b Rights to apply for hold and license IPRs in the genetic resources

Contract No.	Rights to obtain IPR on the resources and products of research and limits on such rights
1	Should a patentable invention result from the COMPANY's or the UNIVERSITY's testing and analytical activity, the COMPANY is free to apply for patents with regard to such invention in its name and at its expense. Any such patents will be filed by the COMPANY indicating the name(s) of the UNIVERSITY, its collaborator(s) and the representative(s) of the COMPANY as the case may be, as inventor(s). To this end, the UNIVERSITY agrees to execute all legally required documents and signatures.
	If and as soon as the COMPANY expresses interest in commercializing chemical products on the basis of the natural constituent(s), the UNIVERSITY shall grant to the COMPANY an exclusive and world-wide right to manufacture, formulate, use and sell products on the basis of the natural constituent(s), isolated from 'Selected Plants'.
2	If 'INTERESTED PARTY ' wishes to protect the results of its investigations based on the material received, by means of some system of intellectual property protection, he will first inform 'SUPPLIER' and the Technical Office of CONAGEBio, before taking any measures of this kind. **** Any intellectual property rights sought with regard to results of investigations into the Genetic Resource must conform to national and international legislation and permit requirements governing such rights.
4	LICENSOR has PBR on [specified genetic strain]. The LICENSEE agrees to the terms and conditions of PBR and agrees to abide and assist LICENSOR for the purposes [national patent law]. Ownership and all rights to, related to, connected with or arising out of the foregoing, including but without limiting the generality of the foregoing, patent rights and copyright in and the right to produce and publish or cause to be produced and published all information material and documents, and the right pursuant to the Plant Breeders' Right Act to issue a license, are vested in and are the sole property of LICENSOR

Table 3.2.7.1b Rights to apply for hold and license IPRs in the genetic resources (continued)

Contract No.	Rights to obtain IPR on the resources and products of research and limits on such rights
4 cont.	The LICENSEE shall not apply for any patent or other right and shall not divulge or disclose, without the prior written consent of LICENSOR, any information, material or documents concerning same or make available in any way or use [specified genetic strain] except as expressly provided in this License Agreement, in a breeding program of the LICENSEE to produce one ore more varieties for the use of the LICENSEE.
5	Upon the filing for patent protection in any country, a Member Institution whose work utilized or is based on genetic information or material provided to the database by DATA-OWNER, shall promptly notify DATA-OWNER (including information relating to the patent filing, including a summary of the invention, filing date and serial number) no later than Member Institution provides such information to any other parties. DATA-OWNER will hold the information provided under this Article 4.3 (a) in confidence for a period of 5 years, or until made public by publication, whichever is sooner. Member Institution shall promptly notify DATA-OWNER of all patent filing which are conceived or reduced to practice within two (2) years from the access of the genetic information or material provided by DATA-OWNER contained in such patent filing.
7	First, Each Party grants the other a royalty-free, non-exclusive licence to use its Background for the purpose of carrying out the Project, but for no other purpose. Neither party may grant any sub-licence to use the other's Background except that the [Research Sponsor] may allow its Group Companies, and any person working for, or on behalf of the [Research Sponsor] or any Group Company, to use the University's Background for the purpose of carrying out the Project, but for no other purpose.
	Second: All Intellectual Property in the Results of this Research shall be the property of the University, which may take such steps as it may decide from time to time, and at its own expense, to register and maintain any protection for that Intellectual Property, including filing and prosecuting patent applications. Where any third party such as a student or contractor is involved in the Project, the University will ensure that student and that contractor assign any Intellectual Property they may have in the Results in order to be able to give effect to the provisions of this clause.
	Third: [The University] [Each of the parties] will notify the [Research Sponsor] [other] promptly after identifying any Result that [the University] [it] believes is patentable, and will supply the [Research Sponsor] [other] with copies of that Result.
10	To the extent that any Intellectual Property in resulting from this research is capable of prospective assignment, the University now assigns those Intellectual Property Rights to the [Research Sponsor]. To the extent any Intellectual Property resulting from this research cannot prospectively be assigned, the University will assign those Intellectual Property Rights to the [Research Sponsor] as and when they are created, at the request of the [Research Sponsor].
	The [Research Sponsor] will provide the University with such information that as the University may reasonably request from time to time to demonstrate that the [Research Sponsor] is exploiting or is taking reasonable steps towards exploiting the results of this Research. If the [Research Sponsor] does not demonstrate that it is exploiting any of those results or is taking reasonable steps towards exploiting them, the Sponsor will, if requested to do so by the University, reassign the Intellectual Property in those results to the University. The [Research Sponsor] will notify the University if the [Research Sponsor] decides not to proceed with the exploitation of any of those results and will, if requested to do so by the University, reassign the Intellectual Property in those results to the University.
11	To the extent that any Intellectual Property in the results of this Research is capable of prospective assignment, the University now assigns those Intellectual Property Rights to the [Research Sponsor]; and to the extent any Intellectual Property in those results cannot prospectively be assigned, the University will assign those Intellectual Property Rights to the [Research Sponsor] as and when they are created, at the request of the [Research Sponsor].
12	The RECIPIENT is free to file patent application(s) claiming inventions made by the RECIPIENT through the use of the MATERIAL but agrees to notify the PROVIDER upon filing a patent application claiming MODIFICATIONS or method(s) of manufacture or use(s) of the MATERIAL.. Except as provided in this Agreement, no express or implied licenses or other rights are provided to the RECIPIENT under any patents, patent applications, trade secrets or other proprietary rights of the PROVIDER, including any altered forms of the MATERIAL made by the PROVIDER. In particular, no express or implied licenses or other rights are provided to use the MATERIAL, MODIFICATIONS, or any related patents of the PROVIDER for COMMERCIAL PURPOSES.
14	Patenting of research results is allowed, however if commercial uses are envisioned, the Recipient is required to obtain written consent from the original Provider, and to negotiate a benefit sharing agreement to capture monetary benefits. The Recipient must notify the Provider of all patents filed and granted.
15	The RECIPIENT is free to file patent application(s) claiming inventions made by the RECIPIENT through the use of the MATERIAL but agrees to notify the PROVIDER upon filing a patent application claiming MODIFICATIONS or method(s) of manufacture or use(s) of the MATERIAL The Recipient shall notify the Provider of all patents filed.

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Table 3.2.7.1b Rights to apply for hold and license IPRs in the genetic resources (continued)

Contract No.	Rights to obtain IPR on the resources and products of research and limits on such rights
15 cont.	[No particular patent right granted or discussed, except that] The PROVIDER MAKES NO REPRESENTATIONS AND EXTENDS NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR THAT THE USE OF THE BIOLOGICAL MATERIAL WILL NOT INFRINGE ANY PATENT, COPYRIGHT, TRADEMARK, OR OTHER PROPRIETARY RIGHTS
19	AGENCY shall file, prosecute, and maintain patent application(s) pertaining to the 'Patent Rights' defined herein and shall promptly provide to the INSTITUTION all serial numbers and filing dates, together with copies of all such applications, including copies of all Patent Office actions, responses, and all other Patent Office communications. In addition, the INSTITUTION will be granted Power of Attorney for all such patent applications. AGENCY shall consult with the INSTITUTION when so requested, prior to communicating with any Patent Office with respect to the Patent Rights
	This Agreement confers no license or rights by implication, estoppel, or otherwise under any patent applications or patents of AGENCY other than 'Patent Rights' specifically defined in this Agreement, regardless of whether such patents are dominant or subordinate to 'Patent Rights'.
20	The INSTITUTION shall make an election with respect to foreign filing, upon consultation with AGENCY including which countries foreign filing will be done prior to the election, within 8 months of any United States filing. If any foreign patent applications are filed, the INSTITUTION shall promptly provide to AGENCY all serial numbers and filing dates. The INSTITUTION also shall provide copies of foreign patent applications and Patent Office actions. The INSTITUTION shall consult with AGENCY when so requested, prior to communication with any Patent Office regarding the Patent Rights, as defined herein.
	In the event AGENCY or the INSTITUTION including its licensees, shall learn of the substantial infringement of any patent subject to this Agreement, the party who learns of the infringement shall promptly notify the other party in writing and shall provide the other party with all available evidence of such infringement. The INSTITUTION and its licensees, in cooperation with AGENCY, shall use their best efforts to eliminate such infringement without litigation. If the efforts of the parties are not successful in eliminating the infringement within ninety (90) days after the infringer has been formally notified of the infringement by the INSTITUTION, the INSTITUTION shall have the right, after consulting with AGENCY, to commence suit on its own account, but AGENCY may join the INSTITUTION's suit or commence its own suit.
	The INSTITUTION may permit its licensees to bring suit on their own account, but only if AGENCY and the INSTITUTION elect not to commence separately or join each other in any suit, other than as nominal party plaintiff, either by formal notice or by failure to act within the ninety (90) day period set forth in Paragraph 8.1 above. AGENCY shall retain the right to join any licensee's suit.
33	PROVIDER hereby appoints RECIPIENT as it sole and exclusive agent for obtaining Patent protection, including obtaining Patents, to commercialize a Product (as defined) and for licensing such product on both parties' behalf.
34	TRANSFEROR shall, after consultation with the applicable collector and/or extractor providing original samples and/or extracts to TRANSFEROR, or upon the DEVELOPER COMPANY's exercise of an option to acquire a license, file a US patent application on all inventions developed by TRANSFEROR, or its employees or collaborating institutions (including SCIENTIFIC INSTITUTE). Inventions developed solely by TRANSFEROR shall be solely owned by TRANSFEROR, inventions made jointly by TRANSFEROR and SCIENTIFIC INSTITUTE shall be jointly owned. Inventorship shall be determined in accordance with the Patent Law of [user country]. Inventors named in any patent may be subject to relevant patent laws, scientists associated with SCIENTIFIC INSTITUTE, TRANSFEROR, other universities, DEVELOPER COMPANY, or scientists associated with collector or extractor, and/or the person or persons who have provided information about a sample that led to the development of a patented Product. For purposes of this agreement, SCIENTIFIC INSTITUTE appoints TRANSFEROR as its sole and exclusive agent for licensing Patents based on the Sample Extracts provided under this Agreement. TRANSFEROR shall notify SCIENTIFIC INSTITUTE, identifying each Product and the Sample Extract from which it was derived, of the filing of a patent application within 30 days after that filing.
	COMPANY shall have the right under this agreement to assume the maintenance of any Patent jointly with TRANSFEROR, if the DEVELOPMENT COMPANY or TRANSFEROR decide to let such patent lapse. TRANSFEROR shall notify COMPANY if it decides to cease to prosecute a Patent jointly owned with COMPANY or to maintain a Patent jointly owned with COMPANY on any product, giving COMPANY enough notices to enable it to assume the prosecution or maintenance of such jointly owned Patent. COMPANY shall have the right to file for Patents jointly owned with TRANSFEROR in any country in which TRANSFEROR or the DEVELOPING COMPANY chooses not to file for a Patent.
39	In the event that any patentable invention is made or conceived solely by COMPANY in connection with any screening, assays or other research and development activities by or at COMPANY, all such inventions shall be owned solely and exclusively by COMPANY, subject to the terms of [national law of user country relating to PROJECT]. If it desires, COMPANY may file patent applications at its own expense. COMPANY shall be under no obligation to utilise any such invention. At no cost to themselves, PROVIDER, UNIVERSITY and FOUNDATION will provide reasonable assistance to COMPANY where applicable and necessary, for the preparation and prosecution of any such patent applications, including where necessary providing COMPANY with additional Samples.

Table 3.2.7.1b Rights to apply for hold and license IPRs in the genetic resources (continued)

Contract No.	Rights to obtain IPR on the resources and products of research and limits on such rights
39 cont.	In the event that any patentable invention is made or conceived solely by some other Party (not COMPANY), as a result of that Party's efforts in connection with the Research, all such inventions shall be owned solely and exclusively by that PARTY, subject to the terms of [national law of user country relating to PROJECT]. Al inventions made jointly by any two or more of the parties hereto, shall be jointly owned by those Parties.
	With respect to any patentable invention giving rise to composition of matter claims and/or therapeutic use claims for a human or veterinary medicinal product or precursor, where COMPANY is not sole owner, COMPANY shall have an exclusive option to acquire from the other Party(ies) owning the invention and exclusive royalty-bearing license to practice such invention in connection with the research, development manufacture, use or sale of human and veterinary medicinal products in any country of the world. [provisions for coming to agreement, in the event of inability to agree within a specified time.]
40	The Parties agree that, whenever requested to do so, they shall assign all ownership and interest in any IPR to the INSTITUTE on behalf of the [user-country] Government, and to obtain specific agreements from all their employees, affiliates, contractors and agents to do so as well. In return, the INSTITUTE agrees to manage all IPR consistent with its (separate) agreement with SPONSORING PROJECT, specifically, in accordance with the [identification of Royalty Sharing provisions]. The INSTITUTE, in its sole discretion, shall take all legal action to protect and perfect the IPR. In the event that the INSTITUTE decides to cease the maintenance and protection of IPR, it shall provide sufficient notice to all Parties, who shall thereafter have an opportunity to continue maintenance of the IPR on their own.
	As to any IPR which is not requested as above, the INSTITUTE shall have as a minimum, an exclusive license with the right to sublicense such IPR.
41	Any party may elect to retain title and to patent a Subject Invention. Such Party will be directly responsible for complying with the statutory licensing and for notification activities to SPONSORING AGENCY under this Agreement and other related Agreements.
	After receipt of a report describing a Subject Invention under this Agreement, the appropriate official for patent matters of each Party shall communicate with each other by telephone, written correspondence or meeting as appropriate, to discuss said disclosed Subject Invention, and to determine inventorship and ownership of said Subject Invention, according to relevant patent law.
SMTA	The RECIPIENT shall not claim any intellectual property or other rights that limit the facilitated access to the Material provided under this Agreement, or its genetic parts or components, in the form received from the Multilateral System
	A RECIPIENT who obtains intellectual property rights on any Products developed from the Material or its components, obtained from the Multilateral System, and assigns such intellectual property rights to a third party, shall transfer the benefit-sharing obligations of this Agreement to that third party

Finally, it is common to specify in some detail which rights are *not* granted, as well as noting which are granted. Table 3.2.7.1c includes a selection of this kind of provisions.

Table 3.2.7.1c IPR-related rights that are retained or not granted

Contract No.	IPR rights withheld, returned or excluded from consideration by contract
1	If the COMPANY or any of its licensees do not take up the manufacture of chemical products on the basis of the natural constituent(s) selected within the Project within 10 (ten) years after execution of the grant, the exclusive right of commercialisation as defined in clause 7 shall lapse and the respective industrial property rights applied for in the name of the COMPANY will be offered for assignment to the UNIVERSITY free of charge.
3	The sorghum seeds produced within the framework of this contract are full exclusive and integral property of the PROPRIETOR of the variety. The PRODUCER cannot withdraw a part or essential element of the seeds produced nor allow them to be withdrawn. The PRODUCER should neither produce nor help some other person to produce this variety of seeds nor even give its name to a variety of similar seeds without prior agreement of the General manager of the PROPRIETOR.
4	The LICENSEE shall not apply for any patent or other right and shall not divulge or disclose, without the prior written consent of LICENSOR, any information, material or documents concerning same or make available in any way or use YYY except as expressly provided in this License Agreement, in a breeding program of the LICENSEE to produce one ore more varieties for the use of the LICENSEE.

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Table 3.2.7.1c IPR-related rights that are retained or not granted (continued)

Contract No.	IPR rights withheld, returned or excluded from consideration by contract
5	[Note this contract is an assignment of genetic resources between users outside of the Source country] Neither party represents that the use of such information or any product or process derived from the GENETIC INFORMATION will not infringe any patent, copyright or other rights of third parties
12	RECIPIENT may not, without written consent from the PROVIDER, provide MODIFICATIONS for COMMERCIAL PURPOSES. Such COMMERCIAL PURPOSES may require a commercial licence from the PROVIDER, and the PROVIDER has no obligation to grant a commercial licence to its ownership interest in the MATERIAL incorporated in the MODIFICATIONS. Nothing in this paragraph, however, shall prevent the RECIPIENT from granting commercial licences under the RECIPIENT's intellectual property rights claiming such MODIFICATIONS, or methods of their manufacture or their use.
13	The RECIPIENT retains ownership of: (a) MODIFICATIONS (except for ownership rights to the MATERIAL included therein as in 1), and (b) those substances created through the use of the MATERIAL or MODIFICATIONS, but which are not PROGENY, UNMODIFIED DERIVATIVES or MODIFICATIONS (i.e., do not contain the ORIGINAL MATERIAL, PROGENY, UNMODIFIED DERIVATIVES). If either 2 (a) or 2 (b) results from the collaborative efforts of the PROVIDER and the RECIPIENT, joint ownership may be negotiated.
14	Patenting of research results is allowed, however if commercial uses are envisioned, the Recipient is required to obtain written consent from the original Provider, and to negotiate a benefit sharing agreement to capture monetary benefits. The Recipient must notify the Provider of all patents filed and granted.
28	RECIPIENT agrees to not to claim ownership over the germplasm received, nor to seek intellectual property right over it and/or its related information
30	Nothing in this agreement, or the use of the Materials by the RECIPIENT, will give the RECIPIENT any property rights in and in relation to the Materials or the Results, including Intellectual Property arising (directly or indirectly) from the RECIPIENT's use of the Materials
SMTA	The RECIPIENT shall not claim any intellectual property or other rights that limit the facilitated access to the Material provided under this Agreement, or its genetic parts or components, in the form received from the Multilateral System

3.2.7.2 Licensing of existing rights in genetic resources and products

ABS contracts generally do not make a clear delineation between licensing provisions and other types of provisions discussed in this chapter (assignment, transfer, patent rights, etc.), owing to the fact that various countries' national commercial laws deal with these issues and use these terms in very diverse ways. In Table 3.2.7.2, several provisions license parties to use patented innovations and other intangible property that is held by one of the parties.

Table 3.2.7.2 Licensing the use the genetic resources and their products

Contract No.	Licensing or other exclusive and non-exclusive rights the use of genetic resources or production of products resulting from the utilisation of genetic resources
8	The UNIVERSITY grants to the SPONSOR [of the research] a non-exclusive, indefinite, fully paid-up, royalty free licence to use the Intellectual Property in any of the Results for any purpose within the Field in the Territory. In addition, if the SPONSOR gives the UNIVERSITY written notice (an Option Notice) at any time during the Project Period plus a further [6][12] months, the parties will negotiate the terms on which the UNIVERSITY will grant the [SPONSOR an exclusive licence (with the right to sub-license) to use certain of the Results. Following the UNIVERSITY's receipt of an Option Notice, the parties will negotiate in good faith, for a period of up to [90 days][6 months] after the date of receipt of the Option Notice (the Negotiation Period) an agreement for the grant of the Licence. If the parties are unable to agree the terms of a licence agreement within the Negotiation Period, this provision will lapse.
9	Upon written notice from the SPONSOR the UNIVERSITY agrees to negotiate the terms on which the UNIVERSITY will license or assign to the SPONSOR the Intellectual Property Rights in certain of the Results (the Assignment). The parties will negotiate in good faith, for a period of up to [90 days][6 months] after the date of receipt of the Option Notice (the Negotiation Period) the terms of the Assignment. [The Assignment will include, without limitation, terms based on the provisions of Schedule 3.] If the parties are unable to agree the terms of the Assignment within the Negotiation Period, the SPONSOR's rights will lapse. .....

Table 3.2.7.2 Licensing the use the genetic resources and their products (continued)

Contract No.	Licensing or other exclusive and non-exclusive rights the use of genetic resources or production of products resulting from the utilisation of genetic resources
9 cont.	Despite the foregoing provisions, the UNIVERSITY and each employee and student of the UNIVERSITY will have the irrevocable, royalty-free right to use the Results for the purposes of academic teaching and academic research[and clinical patient care], including (after the SPONSOR's rights under clause 4.6 have lapsed, but not in any other case) research projects that are sponsored by any third party. The rights in this clause are subject to the rules on Academic Publication in clause 5. [Note: under other provisions of this contract, the SPONSOR's right to a complete assignment as above are null and void if the contract is terminated for cause or due to the insolvency or dissolution of the SPONSOR.]
10	The SPONSOR hereby grants the UNIVERSITY a royalty-free, non-exclusive licence to use the Results for the purpose of carrying out the Project, but for no other purpose. The UNIVERSITY may not grant any sub-licence to use the Results. Any such assignment to the UNIVERSITY is made or will be made with full title guarantee.
	[Alternative to the foregoing] The UNIVERSITY warrants to the SPONSOR that, in relation to any such assignment: (i) the UNIVERSITY has the right to dispose of the Intellectual Property in the Results and that the University it will, at its own cost, do all that it reasonably can to give the title that it purports to give; and (ii) that the Intellectual Property in the Results is free from all charges and encumbrances and rights of any third party (except those that the UNIVERSITY is unaware or could not reasonably be aware of.
11	The SPONSOR grants the UNIVERSITY a royalty-free, non-exclusive licence to use the Results for the purpose of carrying out the Project, but for no other purpose. The UNIVERSITY may not grant any sub-licence to use the Results.
30	PROVIDER grants the RECIPIENT a non-exclusive licence to use the Materials and the Results solely for the purpose of the Approved Research, and in particular to publish data in accordance with requirements of this Agreement.
40	Each Party and its affiliates shall have the option to obtain a non-exclusive license for research purposes, to practice with regard to any IPR under this agreement, anywhere throughout the world.
	The INSTITUTE agrees that it will grant an exclusive license to the IPR obtained under this Agreement, to be negotiated in good faith subject to the provisions of this Agreement. INSTITUTE will seek in these negotiations to maximize royalty revenue and other payments and considerations. IN the event of requests from multiple parties, the INSTITUTE shall confer with all interested Parties but shall have the sole discretion in selecting any licensee. The INSTITUTE may charge any Party who obtains a license under this paragraph an up-front license fee to defray its costs of IPR prosecution or perfection. This up-front fee is not subject to the royalty-sharing provisions under this Agreement.
42	UNIVERSITY will license the development of compounds with [listed uses] to a pharmaceutical firm selected by the UNIVERSITY through a negotiated agreement.

3.2.7.3 Confidential information

Provisions for confidentiality are very important in all contracts involving access to, use of or creation of information. There are four very different types of confidentiality in commercial contracts, however. One is the confidentiality of the commercial information – the terms and contents of the contract itself. This type of provision is very common in commercial ABS contracts.

A second type of confidentiality relates to the party's agreement to maintain trade secrecy regarding the specimens obtained, where they were obtained, the analytical results, and any other results and development involving or relating to the genetic resources.

The third type of confidentiality relates to research in progress. From the perspective of the noncommercial researcher, the information and other noncommercial results obtained are of great personal value, particularly if this information can be published quickly. Such information may also have longer-term value to the source country, as it may ultimately be the basis for commercial development from which the source country may obtain a benefit share. This value to the source country can disappear, however, if the information becomes generally known.

The final type of confidentiality issue has sometimes arisen arising from the fact that some Source Countries are not believed to be able to protect user confidentiality. For example, there are reports that user companies have refused to provide required information to developing country officials regarding the genetic resources being used, because those users felt that the government officials could not ensure that these 'trade secrets' would not be leaked or disclosed to others.[45]

45 Personal communication, M.A. Galvez, September 2006. The country in question felt it needed this information in order to determine what level of control should be imposed on field trials of new species and other uses of the information which might have an impact on species in some locations. In response to this problem, the authors suggest that it may be useful to reorganize the contract placing confidentiality responsibilities with those best

The first type of confidentiality provisions mentioned above are reproduced in Table 3.2.7.3, (as noted, many of these provisions could not be reproduced owing to restrictions imposed on the author by the person providing the contract for review.)

Table 3.2.7.3a Confidentiality regarding the contract and its terms

Contract No.	Confidentiality regarding the terms of this contract
4	The parties agree that any document having information with respect to the following will be treated as confidential under [relevant laws]: ... information the disclosure of which could reasonably be expected to result in material financial loss or gain to, or could reasonably be expected to prejudice the competitive position of, the LICENSEE; or information the disclosure of which could reasonably be expected to interfere with contractual or other negotiations of the LICENSEE.
	Notwithstanding any provision to the contrary in this License Agreement the LICENSEE acknowledges that LICENSOR is subject to the [law governing transparency of governmental information], and related acts and may be required to release, in whole or in part, this Agreement and any other information or documents in [country's] possession or control relating to this Agreement and the Parties to it.
5	Neither party shall use the name of the other party, including the names of any director, officer, employee, student or other party, without the written permission of other party.
	The Genetic Information and Material provided to the database by the [Researcher/Collector] are the confidential property of [Researcher/Collector]. All Members of the database partnership agree that this Genetic Information and Material, or search results contained in it will be maintained as confidential by them until otherwise made public, except that they may share with other Members and the Partnership. Such materials shall never be transferred to any third party, except in compliance with this Agreement.
11	Neither the UNIVERSITY nor the SPONSOR will use the other's name or logo in any press release or product advertising, or for any other promotional purpose, without first obtaining the other's written consent; except that the UNIVERSITY may identify the sums received from the SPONSOR in the UNIVERSITY's Annual Report and similar publications
15	Parties to this Agreement also agree to maintain the terms of this Agreement as confidential trade secrets. RECIPIENT acknowledges that any third parties who, through RECIPIENT's actions, become parties to related separate agreements as in 5 (b), shall also abide by the terms of this paragraph.
29	The parties agree that this Agreement, and any later amendment, shall be available on request or through any means considered appropriate, subject to the following conditions: a) Where repatriated biological diversity is the subject of current research by COLLECTION, PROVIDER agrees to maintain confidentiality of the details of such research and development, if COLLECTION so requests and where this confidentiality is for specific reasons. Confidentiality shall not be required beyond the term required for these specific reasons. b) When the details on any repatriated biological diversity, under this Agreement, have been handed over by COLLECTION under confidentiality terms, PROVIDER agrees to respect those terms.
	This Agreement should not grant rights to either party to act, communicate or take any other action in the name of the other, unless the other party has given its consent
	The parties agree that any financial right or obligation arising from this Agreement and any later amendment of the Agreement should be reported through the appropriate institutional means, or any other relevant means considered acceptable by the parties
30	In demonstration of their good faith, PROVIDER and the RECIPIENT agree to make copies of this agreement available to the public by electronic and other means.
33	Except for the commercially sensitive terms [list of all provisions describing RECIPIENT's obligations regarding royalties and benefit-sharing], both parties shall make copies of this agreement publicly available by (among other reasonable means) sending a copy within a reasonable time, in response to the request of any person.
	Except for the specific trade secrets designated and identified under [specific clauses], both parties shall make public the annual reports [other than financial reports of RECIPIENT] by (among other reasonable means) sending a copy within a reasonable time, in response to the request of any person.

able to perform them. Regarding trade secrets, it might be possible to add the user company's government as a party or participant in the transaction. Then, if the user company and the provider country both trust the user government, it would simplify the situation to call on the user to provide the'secret' information to the an agency of the user government, which would agree to hold them as trade secrets, and to serve as a fiduciary in the transaction in responding to questions regarding particular species issues.

Table 3.2.7.3a Confidentiality regarding the contract and its terms (continued)

Contract No.	Confidentiality regarding the terms of this contract
39	The Parties agree to reach a decision permitting some form of general announcement and public disclosure regarding this agreement and permitting the disclosure of a redacted version of this Agreement, for purposes of generating public goodwill. The text of such general agreement, public disclosure and redacted version must be approved by COMPANY, UNIVERSITY and PROVIDER in writing in advance of any disclosure. However, except as provided herein, no public announcement or other disclosures to third parties concerning the existence of or terms of this agreement shall be made, except as may be legally required by members of the [user-country and source-country] Governments who request specific or general information regarding this agreement.
	The terms of this Agreement shall be kept confidential by all Parties.
	No party shall use the name of any other Party or any adaptation thereof in any advertising, promotional or sales literature without the prior written approval of the Party or individual whose name is being used.
43	The terms of this Agreement shall be kept confidential by all Parties, except that they may be shared with an authorized representative of the government of [Source Country] and of [the User Country] Any exception to the above by any Party to this Agreement will require approval in writing of the other Parties, upon the nature and text of such an announcement or disclosure. No Party shall use the name of any other Party, or any adaptation thereof, including individuals of such Party, in any advertising promotional or sales literature without the prior written approval of such Party and individuals.

Clauses of this type constitute the main reason that copies of ABS contracts between providers and commercial users were mostly unavailable.

The second type of confidentiality provisions (the promise to maintain confidentiality regarding the resources, research and other technical information) is exemplified by the provisions in Table 3.2.7.3b. (Given the close relationship between these provisions and trade secret provisions, trade secret provisions are also included below.)

Table 3.2.7.3b Confidentiality regarding the genetic resources, research and other technical matters

Contract No.	Confidentiality regarding the genetic resources and information being developed about them or through the contract
1	Both parties undertake to treat all technical and commercial information which they receive from each other as strictly secret except for the purposes of this Agreement, The obligation of secrecy shall survive the expiration and/or termination of this Agreement or part of it, for a period of seven (7) years.
4	The parties agree that any document having information with respect to: (i) trade secrets of the LICENSEE; (ii) financial, commercial, scientific or technical information that is confidential information supplied to LICENSOR by the LICENSEE and is treated consistently in a confidential manner by the LICENSEE; (iii) information the disclosure of which could reasonably be expected to result in material financial loss or gain to, or could reasonably be expected to prejudice the competitive position of, the LICENSEE; (iv) information the disclosure of which could reasonably be expected to interfere with contractual or other negotiations of the LICENSEE; will be treated as third party information as per Section 20 of the Access to Information Act. Any request for information will be subject to a notice to the LICENSEE under [national law governing public access to government information].
	The LICENSEE shall not divulge or disclose, without the prior written consent of LICENSOR, any information, material or documents concerning the variety or make it available in any way or use it except as expressly provided in this License Agreement in a breeding program of the LICENSEE to produce a new variety or varieties for the use of the LICENSEE.
11	Neither party will[, either during the Project Period or for [3][5][7][10] years after the end of the Project Period,] disclose to any third party, nor use for any purpose except carrying out the Project, any of the other party's Confidential Information. In providing, discussing or publishing information, neither party will be in breach of any obligation to keep any know-how, innovations, research data, or other results or information confidential or not to disclose it to any other party to the extent that it is:

continued on next page

Table 3.2.7.3b Confidentiality regarding the genetic resources, research and other technical matters (continued)

Contract No.	Confidentiality regarding the genetic resources and information being developed about them or through the contract
11 cont.	(i) known to the party making the disclosure before its receipt from the other party, and not already subject to any obligation of confidentiality to the other party; (ii) or becomes publicly known without any breach of this Agreement or any other undertaking to keep it confidential; (iii) obtained by the party making the disclosure from a third party in circumstances where the party making the disclosure has no reason to believe that there has been a breach of an obligation of confidentiality owed to the other party; (iv) independently developed by the party making the disclosure; (v) disclosed pursuant to the requirement of any law or regulation or the order of any court of competent jurisdiction, and the party required to make that disclosure has informed the other of the requirement and the information required to be disclosed; or (vi) approved for release in writing by an authorised representative of the other party.
	It will not be a breach of the [Research Sponsor]'s obligation to maintain the confidentiality of the University's confidential information for the [Research Sponsor] to make information available to a person working for or on behalf of the Sponsor or a Group Company who needs to know the same in order to exercise the rights granted in this Agreement, so long as the information is not used by any person in a way that is not expressly permitted by this Agreement and kept confidential by such other person.
	If the University receives a request under the [Law governing transparency of government-held information] to disclose any of the [Research Sponsor]'s confidential Information, it will notify the [Research Sponsor] and will consult with the [Research Sponsor.] The [Research Sponsor] will collaborate to determine whether or not an exemption to that law applies to the information requested.
15	RECIPIENT and its employees agree to maintain MATERIAL and PROVIDER and its employees agree to maintain MODIFICATIONS as confidential trade secrets unless: (a) the MATERIAL enters the public domain through the action of third parties who are not parties to this Agreement or to related separate agreements as in 5 (b), or (b) PROVIDER and RECIPIENT notify each other in writing that trade secrecy protection is no longer required.
	All transferred material, including traditional knowledge, shall be treated as confidential trade secrets by the Recipient. To ensure intellectual property protection to the transferred traditional knowledge.
17	If requested by the TRADITIONAL KNOWLEDGE PROVIDER, all parties to this Agreement shall treat transferred intangible components of the MATERIAL as confidential trade secrets in the country of origin. All such requests shall be recorded in writing, either on the signature page of this Agreement or as an attachment. All parties to this Agreement engaged in collecting material from or interviewing the TRADITIONAL KNOWLEDGE PROVIDER shall keep a written log of said material or interviews, depositing one copy with said TRADITIONAL KNOWLEDGE PROVIDER.
18	COMPANY agrees not to disclose any portion of the Application(s) to any third party without prior written permission from AGENCY, shall use reasonable care to maintain the confidentiality of the Application(s) with at least the same degree of care as AGENCY shall exercise in respect of COMPANY's own proprietary information, and shall disclose the Application(s) only to those of COMPANY's employees who have a need to review the Application(s) for the purposes specified in paragraph 4 below
	The following information categories are excluded from the confidentiality obligation: a. Information that was known to COMPANY about the Application(s) prior to their disclosure under this Agreement; b. Information about the Application(s) that is or becomes generally available to the public through no fault of COMPANY; c. Information about the Application(s) that is subsequently made available to COMPANY from any third party that is not under a confidentiality obligation to AGENCY.
24	LICENSEE agrees to submit in confidence a final report to AGENCY within thirty (30) days of termination or expiration of this Agreement outlining in general its results of commercial evaluation of the Licensed Patent Rights, the Licensed Products, and the Materials provided by this Agreement. AGENCY agrees, to the extent permitted by law, to treat in confidence for a period of three (3) years from the date of disclosure any of LICENSEE's written information about the Licensed Patent Rights, the Licensed Products, or the Materials that is stamped 'CONFIDENTIAL' except for information that was previously known to AGENCY or that is or becomes publicly available, or that is disclosed to AGENCY by a third party without an obligation of confidentiality
26	In the exercise of its reserved license to practice the invention, the GOVERNMENT shall not publicly disclose trade secrets or commercial or financial information that is privileged or confidential under the law, or which would be considered as such if it had been obtained from a non-GOVERNMENTAL party.
	All plans and reports required by this Article 9 and marked 'confidential' by LICENSEE shall, to the extent permitted by law, be treated by AGENCY as commercial and financial information obtained from a person and as privileged and confidential, and any proposed disclosure of such records by the AGENCY under the [national law governing public access to information held by government]
30	The RECIPIENT must restrict access to the Materials, the Results, and reports required hereunder to persons directly involved in the Research, who are placed under an obligation to observe the terms of this Agreement. Each party will treat all 'Confidential Information' owned by the other party as Confidential, and will not to disclose to any third person without prior approval in writing from the other party. Disclosure, where legally required, shall not breach these obligations.

Table 3.2.7.3b Confidentiality regarding the genetic resources, research and other technical matters (continued)

Contract No.	Confidentiality regarding the genetic resources and information being developed about them or through the contract
32	The Licensee guarantees the confidentiality of experiments and security of plant material to avoid the risk of theft. Visits to experimental sites are prohibited without the written authorization of the Licensor, who shall have access to all sites. Details of results of experiments must be confidential.
33	During each annual period following the effective date of this Agreement, PROVIDER shall employ citizens or residents of [source country] with appropriate training in the relevant discipline, to participate in research and training on Samples. These persons will be employed by at PROVIDER's facility either as resident researchers or, in the sole discretion of RECIPIENT, as RECIPIENT's visiting researchers. These persons shall comply with and be subject to the ordinary terms under which PROVIDER and RECIPIENT regain personnel including relevant intellectual property and confidentiality agreements which shall include appropriate and customary assignments of Patents and inventions to the employing institution.
	RECIPIENT shall not publish or authorise publication of information regarding a sample or product, including research and development findings, or describing the provenance of the Samples, unless authorised by the PROVIDER in writing. Any such description that is so authorised shall acknowledge the collector, taxonomic identity, geographic location, and (if known) the ecological role of the species or variety represented by the sample. If an ethnobiologist or Indigenous Person or People provided information that led to better understanding or identification of the sample, it shall also acknowledge that contribution in any publication, if requested by the PROVIDER or the ethnobiologist or Indigenous Person or People. RECIPIENT shall take reasonable steps to ensure that its employees, agents and subcontractors also comply with this obligation.
	PROVIDER shall not publish or authorise publication of information regarding a sample or product, including research and development findings, or describing the provenance of the Samples, unless authorised by the RECIPIENT in writing. Any such description that is so authorised shall acknowledge the collector, taxonomic identity, geographic location, and (if known) the ecological role of the species or variety represented by the sample. If an ethnobiologist or Indigenous Person or People provided information that led to better understanding or identification of the sample, it shall also acknowledge that contribution in any publication, if requested by the RECIPIENT or the ethnobiologist or Indigenous Person or People. PROVIDER shall take reasonable steps to ensure that its employees, agents and subcontractors also comply with this obligation.
	Whenever it receives or takes possession of information from PROVIDER that PROVIDER has a duty to submit under this agreement, and thereafter, whenever such information is in its possession, RECIPIENT shall take all reasonable steps to keep confidential any trade secrets contained in the information, which are designated as such by PROVIDER's specifically marking them as 'confidential.' Nothing in this provision shall require RECIPIENT to keep secret any other information received from PROVIDER or that is public information or that is received from some other source over which RECIPIENT has no control, and to whom the RECIPIENT did not supply the information. In addition, RECIPIENT shall be permitted to provide such information where required by a government agency, so long as it takes all measures to protect the information as a trade secret under the laws of that country.
	Obligations of Confidentiality under [specified clauses] shall terminate only upon occurrence of the earliest one of the following events: when the party asserting that information is a trade secret publishes that information or authorizes publication through a third party or states in writing that the information is no longer a trade secret, or when information ceases to be a trade secret as defined in law, or when 5 years have passed following termination of all sample collection and compensation obligations under this Agreement.
	Within one year from termination of the obligations under [specified clauses], either party has the right to demand the return within a reasonable time, of materials submitted to the other party under the Agreement, if these materials were designated as confidential or trade secrets.
	All rights regarding either party's confidentiality and trade secrets shall not be prejudiced or affected by termination of the contract by either party.
34	SCIENTIFIC INSTITUTE shall not release, deliver or disclose to any other party any Sample or Sample Extract delivered by TRANSFEROR.
	Both parties will keep confidential any materials, information and data received from the other party under this Agreement for a period of 5 years from receipt. These confidentiality obligations shall not apply with respect to information that is in the public domain by use and or publication at the time of its receipt from the disclosing party, or was already in possession prior to receipt from the disclosing party, or is developed independently of information received from the disclosing party, or is properly obtained from a third party with a valid right to disclose such information and such party is not under a confidentiality obligation to the disclosing party, or when requested to be disclosed by a government agency.
39	During the term of this Agreement and for 5 years thereafter, the Parties shall not disclose, divulge or otherwise communicate to any unrelated party any Confidential Information (as defined) received from another Party as a result of this collaboration nor use such receive Confidential Information for any purpose, except as contemplated by and in order to carry out the terms and objectives of this Agreement.

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Table 3.2.7.3b Confidentiality regarding the genetic resources, research and other technical matters (continued)

Contract No.	Confidentiality regarding the genetic resources and information being developed about them or through the contract
39 cont.	A party shall have not obligation of confidentiality or nonuse, with respect to (a) information which was known to or in lawful possession of the receiving party prior to the disclosure, or which is developed independently by the receiving party, without reference to or reliance on the disclosed information; (b) information in the public domain, which did not enter the public domain through any act of the receiving party or his employees or agents; (c) information lawfully disclosed to the receiving party by a third party, who has not received the information under an obligation of confidentiality; or (d) information for which the disclosing party has provided a written exception to the foregoing provisions in order to facilitate specific research, manufacturing, marketing or other activities.
	Confidential information may be disclosed to government agencies as required by law, rule or order. In such cases, the party responding to such law, rule or order will provide [number of days] prior written notice of such disclosure to the other Parties and shall take reasonable and lawful actions to minimise the degree of disclosure and to maintain confidentiality protection over such information.
40	'proprietary information' means information marked with a proprietary legend which embodies trade secrets developed at private expense or which is confidential business or financial information. Propriety information does not include information that (i) is generally know or available from other sources without obligations concerning its confidentiality (ii) has been made available by the owners to others without obligation concerning its confidentiality; and (iii) is already known by the recipient prior to receipt.
	Confidential information obtained from non-Parties shall be protected by a confidentiality agreement, where appropriate. In particular, where a Party obtains confidential information from a source, such as a traditional healer, in a source country, then the Party must obtain an agreement providing compensation to that source for disclosing the confidential information, unless the source is a Party to this Agreement. Forms for informed consent for these activities are attached hereto as Annexes.
43	Each Party may disclose to any other party its own information and the results of data which it considers confidential or proprietary, which shall be considered as Confidential Information if the disclosing party marks it as 'Confidential' or 'Proprietary' or if such information, results or data is disclosed orally, the disclosing Party indicates such disclosure is confidential or proprietary and summarizes such disclosure in writing within 30 days of oral disclosure. For 5 years following the term of this agreement, any recipient of this information shall neither disclose it to third parties or to anyone other than its employees, agents or contractors who have a need to know and who are bound to terms of confidentiality no less restrictive than those terms therein.
46	The requirements of this Instrument relating to Confidential Information will apply to the conduct of any review of the functioning of this Instrument, and the parties will take all practicable steps to ensure that the person conducting a review complies with those requirements.
	A Party must not, without the prior written consent of the other Party, use or disclose any Confidential Information of the other Party. In giving written consent to use or disclose its Confidential Information, a Party may impose such conditions as it thinks fit, and the other Party agrees to comply with these conditions. A Party may at any time require the other Party to arrange for the other Party's employees, servants or agents to give a written undertaking in the form of a Deed relating to the use and non-disclosure of the first Party's Confidential Information. If a Party receives a request for consent to disclose Confidential Information, it must promptly arrange for all such undertakings to be given.
	The obligations on a Party under this clause will not be taken to have been breached to the extent that Confidential Information is (a) disclosed by a Party to its employees, servants or agents solely in order to comply with obligations, or to exercise rights, under this Instrument; (b) disclosed to a Party's internal management personnel, solely to enable effective management or auditing of activities related to this Instrument; (c) shared by a Party within its organization, where this serves the Party's legitimate interests; (d) disclosed by a Party, in response to a request by a GOVERNMENT; (e) authorised or required by law to be disclosed; (f) disclosed by a Party and is information in a material form in respect of which an interest, whether by licence or otherwise, in the Intellectual Property Rights in relation to that material form, has vested in, or is assigned to, the Party under this Deed or otherwise, and that disclosure is permitted by that licence or otherwise; or (g) in the public domain otherwise than due to a breach of this clause.
47	The obligations on a Party under this clause will not be taken to have been breached to the extent that Confidential Information is (a) disclosed by a Party to its employees, servants or agents solely in order to comply with obligations, or to exercise rights, under this Deed; (b) disclosed to a Party's internal management personnel, solely to enable effective management or auditing of activities related to this Deed;
	(c) disclosed by the DEPARTMENT to the DEPARTMENT'S Minister; (d) shared by a Party within its organization, or in the case of the DEPARTMENT with another department or agency of the CENTRAL GOVERNMENT, where this serves the Party's legitimate interests; (e) disclosed by a Party, in response to a request by a GOVERNMENT; (f) authorised or required by law to be disclosed; (g) is disclosed by a Party and is information in a material form in respect of which an interest, whether by licence or otherwise, in the Intellectual Property Rights in relation to that material form, has vested in, or is assigned to, the Party under this Instrument or otherwise, and that disclosure is permitted by that licence or otherwise; or (h) in the public domain otherwise than due to a breach of this clause

Regarding the third and fourth types of confidentiality described the opening of this section, the contracts reviewed provide few examples, none of which may be published. The Bonn Guidelines say only that a 'Confidentiality clause' is recommended, and include the 'treatment of confidential information' in its indicative list of typical mutually agreed terms.[46]

3.2.7.4 Publication

Even where full confidentiality is not required, the question of publication of genetic resource information and resource results is sometimes controversial. In some recent cases, claims of biopiracy have arisen out of the non-commercial publication of genetic/biochemical information from a developing country. After the publication, the information, no longer confidential, was also no longer valuable to the source country, since it could not be sold again.[47] As a consequence the question of whether the user or recipient of genetic resources can publish research results may be critical to future rights of the source country. Table 3.2.7.4 provides a number of examples from contracts which granted complete or limited rights to publish those results.

Table 3.2.7.4 Publication and ownership of research results

Contract No.	Ownership and/or publication of research information and results
2	INTERESTED PARTY will make reference to this Agreement and give proper recognition of the origin and/or provenance of the materials transferred, including giving such credit in publications and other results of result of the investigations made from the material or of information provided by SUPPLIER.
5	DATA-OWNER contributing genetic information and materials to the database and all PARTNERS using the database agree that any one or more PARTNERS may publish, in electronic or widely circulated publications, or present in an open public forum, the results of the research, including information obtained from a search of the information and material provided by the DATA-OWNER. Any such publication will be published in such a way that the GENETIC INFORMATION provided by DATA-OWNER is not published alone but only published combined with other data from the database. Moreover, any such publication shall meet sequencing quality, accuracy and finishing standards. In the case of written publications, the publishing PARTNER(s) shall provide one copy to the DATA-OWNER as soon as such publication is available. Publications resulting from this program shall contain an appropriate acknowledgement of the use of the DATA-OWNER's data.
6	USER shall publicly identify and give credit to the origin of the genetic and biochemical elements and resources used, in any publication, proceeding or later use that occur. This agreement shall not be interpreted to prevent or delay publication of research findings resulting from the use of the MATERIAL or the MODIFICATIONS.
15	Upon request by either party, publication of research findings resulting from the use of the MATERIAL or the MODIFICATIONS, subject to the restrictions in 6, may be delayed by a period of up to 3 months, in order to facilitate the acquisition of intellectual property protection. The RECIPIENT SCIENTIST agrees to provide appropriate acknowledgement of the source of the MATERIAL in all publications.
20	LICENSEE is encouraged to publish the results of its research projects using the Materials. In all oral presentations or written publications concerning the Materials or Licensed Products, LICENSEE will acknowledge the contribution of [individual researcher and the AGENCY supplying the Materials, unless requested otherwise by AGENCY.
30	[One stated purpose of the research permitted under the agreement] 'to publish a freely shared, global environmental genomics database that can be freely used by any person or entity.'
	PROVIDER grants the RECIPIENT a non-exclusive licence ... in particular to publish data in accordance with this Agreement. The RECIPIENT must not, however, publish or publicly disclose details of the Materials or the Results without the prior written approval of PROVIDER. The RECIPIENT will publish or publicly disclose genomic sequence data, including a limited and reasonable description, of the Materials consistent with generally accepted database curation standards in accordance with the Publication Requirements specified in the Schedule. The RECIPIENT may at the time of publication or public disclosure under clause 6.2 publish an article relating to the Approved Research in an appropriate magazine or journal or other publication.
	The RECIPIENT agrees to acknowledge, PROVIDER as the source country and that the Materials were obtained in accordance the laws and requirements of PROVIDER, the role of PROVIDER scientists, in any publication arising out of the RECIPIENT's use of the Materials and, where any significant advice or recommendations have been provided by an PROVIDER scientist, the RECIPIENT agrees to acknowledge the authorship of that person

continued on next page

46 Bonn Guidelines, Appendix I, Art.C.11

47 Mgbeoji, 2006.

Table 3.2.7.4 Publication and ownership of research results (continued)

Contract No.	Ownership and/or publication of research information and results
31	[This agreement calls for] ...joint authorship of publications wherever possible, including acknowledgement of PROVIDER as the source of Material in research publications.
32	The Licensee shall not publish or under any circumstances disclose any results relating to experiments with contract-related material without the prior consent of the Licensor. In any case, such publication shall be scientific or technical and shall not violate the rights of the Licensor to title or property.
33	RECIPIENT shall not publish or authorise publication of information regarding a Sample of Product unless authorised by the PROVIDER in writing,. Any description that is so authorized may be brief, but shall acknowledge the following facts: The collector providing the sample, its taxonomic identity, geographic location and (if known) the ecological role of the species or variety represented by the Sample. If an ethnobiologist or Indigenous person or People provided information that led to identification or better understanding of the sample or Product, RECIPIENT shall also acknowledge that contribution, if requested by PROVIDER at the request of the Indigenous Person or People. RECIPIENT shall take responsible steps to ensure that its employees, agents and subcontractors comply with this obligation.
34	TRANSFEROR and SCIENTIFIC INSTITUTE agree not to publish information regarding a Sample, Sample Extract or Product, including research and development findings or describing the provenance of the Sample, etc. unless authorised in writing by the original collector [PROVIDER under another contract, who is not a party to this contract.] [provisions as above about what an authorised publication shall contain acknowledging the origin.]
39	The Parties agree that all publications [of results of their collaboration] will credit the Parties jointly unless otherwise agreed, and that the authoring Party will provide a copy of said document for review and comment by other Parties [insert time period] prior to initial submission for possible publication. The parties will mutually agree upon all comments, additions and changes which are to be incorporated in the final version of any such document, in writing after negotiating the contents in good faith. The publication will be delayed for a reasonable period [redated text] until any intellectual property contained in the document is adequately protected. All publications or oral presentations of work done under this Agreement will acknowledge joint support, as required under the terms of the PROJECT rules and any subsequent award issued by the [user-country] Government in support of this research.
40	Prior to making a public oral presentation or submitting a manuscript for publication or review which contains the results of research under this Agreement, each Party shall be offered an ample opportunity to review a proposed manuscript, for a period not exceeding 60 days. [Further provisions specifying copyright and trademark protection is also potentially taken in the name of the SPONSORING PROJECT.]
46	The ACCESS PARTY will acknowledge the [Source Country's] provision of access to biological resources in all dealings with third parties with respect to R&D Activity, and will ensure that any agreement with a third party under requires that third party acknowledges the ACCESS PROVIDER.

These provisions do not discuss all aspects of the publication issue, nor address or prevent the primary conflicts that have arisen in the context of ABS Contracts and post-CBD genetic research.

3.2.8 Management of termination and change

The ways that Parties address time, termination, amendment, rescission and other operational matters, while often very standardized, are also very important. The standardization of these provisions arises out of the fact that they are critical components of legal certainty for the parties in all contracts. In ABS contracts, these issues have not yet been practically tested by courts or legislative bodies, so provisions addressing them may not, as yet, cover all ways in which an ABS contract's provisions should differ from more conventional contracts.

3.2.8.1 Time issues and Termination of the Contract

Provisions for timing, termination and revision are very standard elements of any contract. For ABS, questions of time may be particularly important, given the extremely long period between bio-collection and any research results, products or other benefits for sharing. The Bonn Guidelines specifically mention timing provisions as potential elements of MAT, but do not identify what those provisions should say. To date, the few examples of time provisions in ABS contracts (Table 3.2.8.1a) do not provide many clear suggestions of how to deal with these special concerns.

Table 3.2.8.1a Timing

Contract No.	Timing
2	The present agreement shall be effective from the date of execution/signature and is valid for _[number of years/months] until _[termination date]__.
6	This Agreement will have a term of ___ years, counted from the date of company/signature. It may be extended for additional periods of _____ years, upon written request of the USER (submitted at least three months prior to expiration of the current term or extension), with approval of AGENCY, upon review of the Agreement with regard to its support for conformance with [specifically identified national biodiversity law]. If the AGENCY fails to respond, the USER must assume that the Agreement has not been renewed.
18	Company's obligations under this Agreement shall remain in effect for seven (7) years from the date specified below.
21	This Agreement shall be in full force and effect from the date first herein written and shall remain in effect for the life of the last to expire patent contemplated by this Agreement, unless otherwise terminated by operation of law or by acts of the parties in accordance with the terms of this Agreement
22	This Agreement shall become effective on the date when the last party to sign has executed this Agreement and shall expire ___ years from this effective date, unless previously terminated under the terms of this Agreement
33	The term of this Agreement shall be 5 years.
39	The term of this Agreement shall be coterminous with the term of funding provided by PROJECT.
46	This Instrument shall commence on the date a permit is issued to the ACCESS PARTY to access biological resources to which this Instrument relates
SMTA	This Agreement shall remain in force so long as the Treaty remains in force.

Similarly, in ABS situations, it is nearly impossible to 'unwind' the transaction, in the event of termination (for breach of contract or other reasons). Once the contract has begun, the possession of genetic resources and the information from them may be very difficult to 'take back.' Consequently, the use of conventional provisions for termination and/or amendment of contracts may have very different impacts in ABS situations. Here also, a number of examples of termination provisions exist (Table 3.2.8.1b), which offer some limited guidance about how these concerns have been addressed (or not addressed) in ABS contracts.

Table 3.2.8.1b Termination clauses

Contract No.	Termination, expiration, cancellation and impossibility clauses
1	This Agreement shall enter into effect on [date] and shall remain in force until [date].
2	'SUPPLIER' reserves the right to cancel this Agreement, in the event of provable violation or failure.
	At the completion of the term of the contract, or upon termination by either party, 'INTERESTED PARTY' will destroy or return to 'SUPPLIER' all remaining material transferred, at 'INTERESTED PARTY's' sole cost and in accordance with 'SUPPLIER's' instructions.
3	In the event of unforeseeable conditions of the countryside, not caused by the producer, the producer will receive an amount of money by way of compensation from the Project; less the value any advances,
	Any cancellation allowed under this contract will occur upon 48-hours notice by the non-defaulting party to the defaulting party. The defaulting party must refund to the other the amount of any advances received, as well as (if applicable) the monetary value of the seeds and the manure provided by the PROPRIETOR and (if applicable) a refund to PRODUCER of the estimated financial equivalent of the additional workload caused in proportion to the work completed by the Landowner as of that date. In the event that the termination is not caused by fault of either party, but by some the cause beyond the Parties' control, i.e. any unforeseeable and or insurmountable event preventing the normal execution of this contract by one of the parties, no Party required to provide such reimbursement.

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Table 3.2.8.1b Termination clauses (continued)

Contract No.	Termination, expiration, cancellation and impossibility clauses
4	This License Agreement may be terminated forthwith by LICENSOR without compensation to the LICENSEE if: (i) The LICENSEE fails to provide their best efforts to commercialize any new variety created under this License Agreement (ii) The LICENSEE fails to make any payment provided for herein and does not make such payment within 60 days; (iii) The LICENSEE commits or permits a breach of any of the other terms and conditions herein contained and does not remedy such breach within 90 days after being required in writing to do so by LICENSOR: (iv) The LICENSEE becomes bankrupt or insolvent, or has a receiving order made against it or has a receiver appointed to continue its operations, or passes a resolution for winding up, or takes the benefit of any statute for the time being in force relating to bankrupt or insolvent debtors of the orderly payment of debts; or (v) The LICENSEE assigns this agreement without the prior written consent of LICENSOR, contrary to this License Agreement.
7	Either party may terminate this Agreement with immediate effect by giving notice to the other party if: (i) the other party is in breach of any provision of this Agreement and (if it is capable of remedy) the breach has not been remedied within [30][60][90] days after receipt of written notice specifying the breach and requiring its remedy; or (ii) he other party becomes insolvent, or if an order is made or a resolution is passed for its winding up (except voluntarily for the purpose of solvent amalgamation or reconstruction), or if an administrator, administrative receiver or receiver is appointed over the whole or any part of the other party's assets, or if the other party makes any arrangement with its creditors.
	Each of the parties will notify the other promptly if at any time any of the Key Personnel appointed by that party is unable or unwilling to continue to be involved in the Project. Within [3][6] months after the date of that notice, the party who originally appointed that member of the Key Personnel will nominate a successor. The other party will not unreasonably refuse to accept the nominated successor, but if the successor is not acceptable to the other party on reasonable grounds, or if the appointor cannot find a successor, either party may terminate this Agreement with at least 3 months' notice.]
12	This Agreement will terminate on the earliest of the following dates:
	(a) when the MATERIAL becomes generally available from third parties, for example, through reagent catalogs or public depositories (in which case the RECIPIENT shall be bound to the PROVIDER by the least restrictive terms applicable to the MATERIAL obtained from the then-available resources) or
	(b) on completion of the RECIPIENT's current research with the MATERIAL (in which case the RECIPIENT will discontinue its use of the MATERIAL and will, upon direction of the PROVIDER, return or destroy any remaining MATERIAL. The RECIPIENT, at its discretion, will also either destroy the MODIFICATIONS or remain bound by the terms of this agreement as the apply to MODIFICATIONS), or
	(c) on 30 days written notice by either party to the other. If such termination is other than for breach of this Agreement or for cause such as an imminent health risk or patent infringement, the PROVIDER will defer the effective date of termination for a period of up to one year, upon request from the RECIPIENT, to permit completion of research in progress. Upon the effective date of termination, or if requested, the deferred effective date of termination, RECIPIENT will discontinue its use of the MATERIAL and will, upon direction of the PROVIDER, return or destroy any remaining MATERIAL. The RECIPIENT, at its discretion, will also either destroy the MODIFICATIONS or remain bound by the terms of this agreement as they apply to MODIFICATIONS; or
	(d) on the date specified herein (in which case the RECIPIENT will discontinue its use of the MATERIAL and will, upon direction of the PROVIDER, return or destroy any remaining MATERIAL. The RECIPIENT, at its discretion, will also either destroy the MODIFICATIONS or remain bound by the terms of this agreement as the apply to MODIFICATIONS)
18	AGENCY may terminate this Agreement upon at least sixty (60) days written notice to the INSTITUTION, but in any event not less than sixty (60) days prior to the date on which any pending Patent Office actions need be taken to preserve patent rights for the benefit of the parties hereto.
	The INSTITUTION may terminate this Agreement in whole or in part if: a) AGENCY fails to make payments or periodic reports required by this Agreement; b) AGENCY has committed a substantial breach of a covenant or duty contained in this Agreement; or c) AGENCY and the INSTITUTION are involved in a dispute under this Agreement which cannot be resolved under the procedures specified in Paragraph 9.2. If the Agreement is terminated under this Section 10.3, the INSTITUTION agrees to provide affected licensees an opportunity to license the 'Patent Rights' (as defined in this Agreement) under such terms as may have been agreed to by AGENCY
19	If the INSTITUTION terminates this Agreement, AGENCY may elect to request the transfer of the INSTITUTION's rights in the Patent Rights or the control of any or all patent prosecutions being performed by the INSTITUTION or its agents related to the Patent Rights or the assignment of any and all licenses issued by the INSTITUTION for said Patent Rights. AGENCY shall make its election and shall advise the INSTITUTION in writing within 30 days after receipt of notice of termination, and the INSTITUTION shall thereupon transfer to AGENCY its rights in the Patent Rights, control of any or all patent prosecutions, and licenses. The INSTITUTION shall do all things necessary to transfer file wrappers and other files related to such rights and license to AGENCY or its designee. In the event AGENCY elects to request the transfers or assignments provided for in this Agreement, and upon perfection of said transfers or assignments, the INSTITUTION shall have no further rights or obligations under this Agreement, except that AGENCY shall distribute royalties due to the INSTITUTION's Inventors in accordance with AGENCY royalty-sharing policy.

Table 3.2.8.1b Termination clauses (continued)

Contract No.	Termination, expiration, cancellation and impossibility clauses
20	In the event the INSTITUTION has made no commitments to any third party for exclusive license rights pertaining to the Patent Rights, AGENCY may terminate this Agreement for any reason upon thirty (30) days written notice to the INSTITUTION.
	During the term of any option agreement or license agreement to any third party for exclusive license rights pertaining to the Patent Rights between the INSTITUTION and an optionee or licensee, AGENCY may terminate this Agreement when it is determined by GOVERNMENT's Office of Technology Transfer that: i) The INSTITUTION or its licensee has not taken effective steps to achieve Practical Application of the Patent Rights; or ii) Termination is necessary to alleviate health or safety needs; or iii) Termination is necessary to meet requirements for public use specified by relevant law or regulations and such requirements are not reasonably satisfied by the INSTITUTION or its licensees; or iv) Termination is necessary [under law of GOVERNMENT], and either the INSTITUTION has not responded within 30 days where such response is required by law, or its response has been determined to be insufficient by the relevant Office of GOVERNMENT.
	AGENCY may terminate this Agreement in whole or in part if: a) the INSTITUTION fails to make any payment or periodic reports required by this Agreement; b) the INSTITUTION has willfully made a false statement of, or willfully omitted, a material fact in the negotiation of the Agreement or in any report required by the Agreement; c) the INSTITUTION has committed a substantial breach of a covenant or duty contained in this Agreement; or d) AGENCY and the INSTITUTION are involved in a dispute under this Agreement which cannot be resolved under the procedures specified in Paragraph 9.2. If the Agreement is terminated under this Section 10.6, AGENCY agrees to provide affected licensees an opportunity to license the Patent Rights subject to relevant law.
	Following termination by AGENCY, AGENCY shall have no further rights or obligations under this Agreement, except that the INSTITUTION shall be obligated to administer subsequent gross proceeds from licensing the Patent Rights according to the INSTITUTION policy, and to distribute royalties to AGENCY for AGENCY Inventor(s) as though they were Inventor(s) of the INSTITUTION under that policy with respect to royalty amounts and payment schedules.
21	THE INSTITUTION may terminate this Agreement upon at least 60 days written notice to AGENCY, but in any event not less that 60 days prior to the date on which any pending Patent Office actions need be responded to in order to preserve patent rights for the benefit of the parties hereto. THE INSTITUTION agrees to pay AGENCY all Recoverable Costs not previously paid by THE INSTITUTION within 30 days of the termination of this Agreement.
22	LICENSEE may terminate this Agreement upon 60 days written notice to AGENCY. AGENCY may terminate this Agreement if LICENSEE is in default in the performance of any material obligation under this Agreement, and if the default has not been remedied within 90 days after the date of written notice by AGENCY of such default. Upon termination or expiration of this Agreement, LICENSEE agrees to return all Materials to AGENCY, or provide AGENCY with certification of their destruction. Within 90 days of termination or expiration of this Agreement, LICENSEE agrees to submit a final report to AGENCY, and to submit to AGENCY payment of any royalties due
26	LICENSEE may elect to surrender its rights in any country of the Licensed Territory under any Licensed Patent Rights upon ninety (90) days written notice to AGENCY and owe no payment obligation for patent-related expenses incurred in that country after ninety (90) days of the effective date of such written notice
30	PROVIDER may terminate this Agreement for material breach of this Agreement at any time by giving 14 days written notice to the RECIPIENT. In that event, the RECIPIENT must return any unused Materials to PROVIDER at its cost, if demanded by PROVIDER, whether on termination of this agreement; or once the Materials are no longer required for the Approved Research.
33	PROVIDER may terminate obligations under (specific section), or RECIPIENT may terminate obligations under (specific section) at any time upon 6 months' written notice to the other party.
	RECIPIENT's obligations under [specified clauses] and PROVIDER's rights under [specified clauses] with respect to any Product (as defined) shall extend until the latest date of expiration of any Patent on that Product, or 25 years after the effective termination of PROVIDER's obligations under [specified clauses], whichever date is earlier. These rights shall not be prejudiced or affected by termination of this contract.
	The performance by RECIPIENT under this Agreement may be dependent on the appropriation of funds by the [provincial government in the region where RECIPIENT university is located.] Should the government fail to appropriate the necessary funds, RECIPIENT may cancel this agreement without any further duty or obligation. RECIPIENT agrees to notify other parties as soon as possible after the unavailability of funds comes to its attention. Similarly, the Governor of [same provincial government] may cancel this Agreement by written notice to the parties if any person involved in obtaining, drafting or procuring this Agreement later becomes an employee or consultant of PROVIDER, unless all requirements under [relevant law of user provincial government] have been met.
	PROVIDER's and RECIPIENT's obligations regarding conservation activities and the distribution of benefits under this agreement shall terminate one year following the termination of PROVIDER's collection obligations under this Agreement.
39	In the event that any Party hereto shall commit any breach or default in the performance of any term or condition of this Agreement and shall also fail to reasonably remedy such default or breach [time period] after receipt of written notice from another Party, any non-breaching Party may, at its option and in addition to any other remedies which it may have at law or in equity, terminate this Agreement by sending notice of termination to the other Party(ies). Termination shall be effective as of the date of receipt of such notice.

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Table 3.2.8.1b Termination clauses (continued)

Contract No.	Termination, expiration, cancellation and impossibility clauses
39 cont.	Upon termination, each party shall return to the disclosing Party all copies of confidential information of that party, except that the party that has received such information shall be entitled to retain one copy of the Confidential Information in its legal records solely for the purpose of determining its obligations hereunder
40	In the event of termination, the Parties shall specify by written notice concerning the disposition of all IPR or other results of work accomplished or in progress, arising from or performed under this agreement. Upon receipt of a written termination notice, the parties shall not make any new commitments and shall, to the extent feasible, cancel all outstanding commitments that related to this Agreement.
46	This Instrument may be terminated at any time by mutual agreement in writing.
	Where the ACCESS PARTY fails to satisfy any of its obligations under this Instrument, the ACCESS PROVIDER may by written notice terminate this Instrument, (a) immediately, if it considers that the failure is not capable of remedy, or (b) within a reasonable time after a written notice demanding remedy, if it determines that the failure is capable of remedy.
	If this Instrument is terminated, the ACCESS PARTY will not thereafter use any Samples or Products or any Intellectual Property arising from R&D Activity; nor may he cause, permit or allow them to be used. The ACCESS PARTY will deliver to the ACCESS PROVIDER or destroy all Samples and Products that are the subject of this Agreement. Following termination, the ACCESS PARTY's rights in all third party agreements shall be assigned to the ACCESS PROVIDER.
	Termination of this Instrument will not affect the right of the ACCESS PARTY to sell Products or material containing a Product, by way of retail sale under commercial arrangements existing at the date of termination, and the ACCESS PARTY's obligation to provide Exploitation Revenue will survive the termination.

The primary tool for addressing the problems of termination in ABS contracts is a 'survivability' provision, which states that some provisions will 'survive' beyond the termination of the contract. These provisions (examples in Table 3.2.8.1c) run a gamut from very simple to relatively detailed.

Table 3.2.8.1c Provisions that survive termination

Contract No.	Rights or responsibilities that 'survive' beyond termination
1	Notwithstanding termination, the terms of this Agreement shall continue to be applied with respect to any plant and/or extracts which have been handed over to the COMPANY prior to December 31st 2002 and which has not returned to the UNIVERSITY by declaration that the COMPANY has no further interest in that plant or extract for purposes of this contract.
2	Notwithstanding termination, the provisions of article 7 above, shall survive the termination of this Agreement.
4	LICENSEE Duties on Termination. Upon termination or expiration of this License Agreement, the LICENSEE shall, at its own cost; (i) Deliver a detailed statement to LICENSOR of the inventory of any Licensed Product then existing but not sold by the LICENSEE as of the date of expiration or termination; (ii) Provide LICENSOR or a designate of LICENSOR the right of first refusal to purchase from the LICENSEE any remaining seed stocks at fair market value; and (iii) Pursuant to section 17.3.2, and subsequent to any exercise or waiving of this right, the LICENSEE shall dispose of any remaining pedigreed seed stocks as prescribed by LICENSOR..
	Termination shall be without prejudice to the right of LICENSOR to sue for and recover any royalties or other sums due LICENSOR and without prejudice to the remedy of either party in respect of any previous breach of this AGREEMENT. In the event of termination, the LICENSEE shall pay to LICENSOR any royalties, annual royalties due and payable pursuant hereto beyond the termination of the License Agreement, in accordance with [this Agreement's provisions regarding Termination.]
	In addition to the foregoing, the LICENSEE's obligations relating to Indemnification of {Licensor's) COUNTRY shall survive early termination or expiration of this License Agreement.
6	Either party may terminate this Framework Agreement at any time, by giving three months' prior written notice to the other party. In the event that either party fails to fulfill some of the terms of this Framework Agreement or of [relevant national ABS law]. Unless otherwise provided in law or in this agreement, all projects exist at the time of termination may continue until their conclusion, as long as they do not contravene [relevant national law.]
	The following clauses [insert list] will survive the expiry of the Project Period or the termination of this Agreement for any reason and will continue indefinitely.

Table 3.2.8.1c Provisions that survive termination (continued)

Contract No.	Rights or responsibilities that 'survive' beyond termination
12	The following paragraphs shall survive termination of this Agreement: [detailed list].
30	The obligations of the parties to preserve the confidentiality of each other's data will continue for a period of 3 years after the date of expiration or termination of this Agreement. Except for this, the obligations of the parties under this clause will survive the expiration or termination of this Agreement
39	Termination or expiration of this Agreement shall not affect the rights and obligations of the parties arising out of events, acts or omissions prior to the effective date of termination, nor release any party from its obligations under [specific sections] with respect to Samples provided prior to termination.
42	COMPANY's obligation to pay royalties pursuant to [specified section] shall remain for the life of the original patent covering any relevant compound or ten years from the first commercial sale of the drug, whichever is longer.
43	Unless otherwise mutually agreed in writing, no termination of this Agreement, however effected, shall affect any rights and obligations that accrued to any Party prior to termination as permitted in this Agreement including rights and obligations regarding options and royalty payments.
46	[Inserted in several provisions throughout the instrument:] The operation of this clause survives the expiration or earlier termination of this Instrument
	The accounts and records required under this instrument shall be maintained for a period of 7 years following the expiration or termination of this Instrument
	Within six (6) months following any collection of Samples or before 1 March first of the year following collection, whichever is the later, the ACCESS PARTY will provide a report to the ACCESS PROVIDER containing the following records for each Sample taken [list]. Where a report includes a Sample of an undescribed species, the ACCESS PARTY must subsequently advise the ACCESS PROVIDER the scientific name of, or given to, the Sample.
	The ACCESS PARTY will provide an initial Annual Report to the ACCESS PROVIDER covering all activities under this Instrument, from the effective date to the end of the calendar year. The report will include, but need not be limited to, the following information for the reporting period [list]. Subsequent Annual Reports will report on activities for the preceding calendar year (the reporting period).
	The ACCESS PARTY will provide such other reports as may reasonably be requested by the Access Provider from time to time.
	Termination of this Instrument will not affect the right of the ACCESS PARTY to sell Products or material containing a Product, by way of retail sale under commercial arrangements existing at the date of termination, and the ACCESS PARTY's obligation to provide Exploitation Revenue will survive the termination.

3.2.8.2 Revision, rescission and amendment

A number of provisions address the post-contract alteration of the contract. Normally, the contract's clauses regarding revisions, rescissions and amendments of contracts are designed to enable the parties to come to new agreements, where circumstances change, such as when unexpected conditions or new opportunities arise. These provisions often enable contract parties to resolve potential and real problems by negotiation rather than confrontation. In general, such provisions are so standardized that they are often found in the final 'boilerplate' provisions (*see* Table 3.2.9.3 and accompanying text).

In ABS, however, there is an additional complicating factor – the primary information about circumstances and situations is entirely within the knowledge of only one of the parties. Consequently, it may be more difficult to engage in a fair 'arm's-length' negotiation to revise the Agreement.

As shown in Table 3.2.8.2, relatively few ABS contracts reviewed contain any provisions discussing future amendment or alteration, apart from the conventional boilerplate statement that the contract may only be amended in writing. Even where non-standard alteration-related provisions are included, they have not so far focused primary attention on the unique aspects of ABS in this context.

Table 3.2.8.2 Revision, rescission and amendment

Contract No.	Amendment and recission
6	If according to the criteria set by the TECHNICAL OFFICE, a particular project of USER merits such a procedure in conformity with national legislation (even if in conformity with this Framework Agreement), the TECHNICAL OFFICE will notify USER that such Project must be excluded from the Agreement. Such notice will include a written statement of the TECHNICAL OFFICE's reason for making this decision
	Should either party wish to modify the present Agreement, it will have to set forth this request in writing, which shall be submitted to the other party, who shall have a period of two months during which it may accept, reject or present a counterproposal.
29	This Agreement may be amended under the mutual agreement of the parties. Any amendment must be explicit and in writing, signed by the representatives of the parties and attached to the Agreement. Any modification related to the role, rights or obligations of NGO should have the consent of the authorised representatives of NGO.
32	The LICENSOR may revoke the authorization he grants (commercial breeding license) at any time, regardless of protests by the LICENSEE. Where the LICENSEE breaches the contract in question, this contract may be revoked 'without prejudice to postal notification'. The LICENSOR may request compensation for damage against the LICENSEE.
36	If PROVIDER submits reasonable evidence that circumstances beyond its ability to meet its obligations… then PROVIDER and RECIPIENT shall negotiate in good faith a modification to such obligations.
46	This Instrument may only be varied by a formal amending instrument executed by both parties.
	The operation of this instrument may be reviewed at the request of either party. The first review may be conducted 2 years after the Commencement Date, and further reviews may be conducted at intervals not less than 2 years. The timing and form of reviews will be agreed between the parties. Either party may request that a review be conducted by an independent person agreed by the parties, and the other party will accede to that request.
	Where a review is conducted by an independent person, the parties will provide all reasonable assistance to, and respond to all reasonable requests for information and assistance from, the person conducting the review, and the cost of the review will be borne by the party requesting the review unless both parties agree beforehand to share equally the costs of the review. The requirements of this Instrument relating to Confidential Information will apply to the conduct of a review and the parties will take all practicable steps to ensure that the person conducting a review complies with those requirements. The parties will discuss the findings and recommendations of each review and may agree to vary the terms and conditions of this Instrument.

3.2.9 Contractual technical provisions

A few key contractual provisions that are found in nearly every contract present particular issues or concerns when used in ABS contracts. The tables in this section examine only a few of these – (i) the provisions selecting law to apply to a particular contract; (ii) the provisions under which the parties report and inform the others about their activities, and (iii) a sampling of 'boilerplate' provisions, to give some indication of the range of other issues that are sometimes of concern in a contract.

3.2.9.1 Governing law and other choice of law provisions

There are three types of conventional provisions regarding applicable law and its interpretation:

(i) 'governing law' provisions, which choose which country's national law will determine whether the contract is valid and binding;

(ii) specific provisions under which particular national laws of one country or another are incorporated as requirements under the contract; and

(iii) provisions which attempt to pre-decide the question of 'choice of law' a complex legal issue which helps determine how a court will interpret and enforce a bi- or multi-national contract.

The complexities of these issues are well beyond the scope of this book, however they are briefly discussed in section 2.3, especially 2.3.4, above. Normally contracts only address these issues briefly. Table 3.2.9.1 provides a selection of all three types of provisions.

Table 3.2.9.1 Governing law, choice of law and incorporation of national law

Contract No.	Governing law, choice of law and incorporation of national law
Governing Law	
1	This Agreement shall be governed by the substantive laws of the home country of the COMPANY
2	This agreement is governed by the laws of [the country of the Supplier. [NOTE: this is the country which has adopted the form.]]
4	This AGREEMENT shall be governed firstly by applicable Federal laws, and secondly by the laws of the Province of [name of province].
30	The RECIPIENT will access and transfer the Materials to its research facility located [in another country] subject to and in accordance with the laws of PROVIDER and of the of the country of the RECIPIENT; and the Access Arrangements
Provisions incorporating National law	
1	With the payments according to clause 3 (fellowship) and clause 7 (royalties) all obligations with regard to the Convention on Biological Diversity of June 5, 1992, which was signed by [country of origin in which UNIVERSITY is located] and the home country of the COMPANY are met.
2	In order for this Agreement to be in force, the provisions set forth above must be authorized by the TECHNICAL OFFICE, as stipulated in [national law on Biodiversity.] Either SUPPLIER or INTERESTED PARTY will present the Agreement before that office in order to obtain the required authorisation. ... In no even shall this Agreement be considered to eliminate the access permit required by the Technical Office with regard to any access to genetic and biochemical elements and resources of biodiversity.
	'[The form includes numerous other provisions which specifically mention particular biodiversity laws, regulations and norms adopted by the country of the SUPPLIER. Beyond these, the form notes that] In addition to the above clauses, the Agreement can contain …. Other clauses, as permitted under the law [of the country adopting this form]. '
6	This Agreement governs the procedures and proceedings for the access to the genetic and biochemical elements and resources, for purposes of bioprospecting, basic analysis, and ensuring the receipt of economic advantage from those elements and resources, which are found within the particular national territory. It is entered in order to be realized by UNIVERSITY in consideration of [specific national law of Source Country], of this Agreement, and of other law of [Source Country]. All elements not discussed in this Framework Agreement shall be governed by pertinent the national [source country] legislation. The parties expressly consent to this and all other in the terms indicated in this document
12	The licence does not exempt the holder from any Act in force within the country. 28. The holder of the licence enters all areas at his or her own risk.
	The Recipient violating this Agreement shall be punished according to the relevant laws [of the Source Country, which is the country promulgating the form].
	The RECIPIENT agrees to use the MATERIAL in compliance with all applicable statutes and regulations, such as, for example, those relating to research involving the use of animals or recombinant DNA.
15	The RECIPIENT violating this Agreement shall be punished according to the relevant laws [of the Source Country, which is the country promulgating the form] and/or any other international legal instrument.
19	The Agreement or anything related thereto shall not be construed to confer on any person any immunity from or defenses under the antitrust laws or from a charge of patent misuse, and the acquisition and use of rights pursuant to this Agreement shall not be immunized from the operation of the law GOVERNMENT, by reason of the source of the grant.
22	LICENSEE agrees in its use of any AGENCY-supplied materials to comply with all applicable statutes, regulations, and guidelines, including regulations and guidelines of AGENCY and related GOVERNMENT bodies. LICENSEE agrees not to use the Materials or the Licensed Products for research involving human subjects or clinical trials without complying with [national law of GOVERNMENT,] or where such activities are occurring outside of the country, without notifying AGENCY in writing, of such research or trials and complying with the applicable regulations of the appropriate national control authorities.
25	LICENSEE acknowledges that it is subject to and agrees to abide by the laws and regulations of GOVERNMENT, controlling the export of technical data, computer software, laboratory prototypes, biological material and other commodities. The transfer of such items may require a license from the cognizant agency or written assurances by LICENSEE that it shall not export such items to certain foreign countries without prior approval of such agency. AGENCY neither represents that a license is or is not required or that, if required, it shall be issued
29	The parties agree to notify the Peruvian authority responsible for regulating access to genetic materials of any repatriation of agricultural biological material carried out under this Agreement.
30	The RECIPIENT must ensure that its use of the Materials complies with all relevant laws, codes of practice and ethical principles
36	When necessary an environmental impact assessment and/or a census of the species will be commissioned to ensure that the plant is not threatened by over-harvesting.

continued on next page

Table 3.2.9.1 Governing law, choice of law and incorporation of national law (continued)

Contract No.	Governing law, choice of law and incorporation of national law
42	The question of ownership of any invention or discovery derived from research under this contract, for purposes of IPR, shall be determined in accordance with applicable law in the country in which any invention or discovery is made. UNIVERSITY
46	This instrument shall take effect only if an access permit is issued to the ACCESS PARTY for the proposed access to biological resources to which this Instrument relates
	Nothing in this clause derogates from any obligation which the Access Party may have either under the Privacy Act, or under this Deed, in relation to the protection of Personal Information
SMTA	The applicable law shall be General Principles of Law, including the UNIDROIT Principles of International Commercial Contracts 2004, the objectives and the relevant provisions of the Treaty, and, when necessary for interpretation, the decisions of the GOVERNING BODY.
Provisions affecting choice of law	
2	Simply by being in possession of the material transferred by SUPPLIER, the INTERESTED PARTY communicates its implied acceptance of the clauses of this Agreement, which shall thereafter be considered binding on the INTERESTED PARTY.
12	This Agreement and the Parties' rights and duties outlined herein shall be interpreted under the laws of country, without reference to conflicts of law provisions.
19	This Agreement shall be construed in accordance with the law of [the GOVERNMENT and of the district in which AGENCY is located.] That law and regulations will preempt any conflicting or inconsistent provisions in this Agreement. INSTITUTION agrees to be subject to the jurisdiction of GOVERNMENT's courts
29	This Agreement is within the framework of the principles established in the Convention on Biological Diversity (CBD), the FAQ International Treaty on Plant Genetic Resources for Food and Agriculture, and other relevant international, regional and national agreements and treaties with which it is compatible. The two parties agree to adapt this Agreement to other relevant legislation and regulations which come into force in the future
33	This agreement and the parties rights and duties hereunder shall be interpreted under the laws of [RECIPIENT's home state], without reference to conflict of laws provisions
39	This Agreement shall be construed and the respective rights of the Parties hereto determined according to the substantive law of [the GOVERNMENT and of the district in which AGENCY is located], notwithstanding the provisions governing conflict of laws under such jurisdiction's law
42	The International Chamber of Commerce shall have exclusive jurisdiction in judicial matters and the English version (of the contract) shall prevail.
SMTA	This Agreement is entered into within the framework of the Multilateral System and shall be implemented and interpreted in accordance with the objectives and provisions of the Treaty.
	The parties recognize that they are subject to the applicable legal measures and procedures, that have been adopted by the Contracting Parties to the Treaty, in conformity with the Treaty, in particular those taken in conformity with Articles 4, 12.2 and 12.5 of the Treaty

The 'choice of law' issue is very complicated. As a legal matter, it is not clear whether the provisions listed in Table 3.2.9.1 under the heading 'Provisions affecting choice of law' will have any legal effect in a court. In essence, these provisions are the contract's attempts to predecide judicial matters, as discussed in 2.3.4, above.[48] They will probably only be binding if the court which is hearing the case is a party to the contract. Consequently, the general rule is that the application of national choice of law systems cannot be finally decided before the case is filed.

3.2.9.2 Reporting and contract-related inspection

The informational side of a contract is very important in ABS. These provisions have been very detailed in many of the ABS contracts reported in this book. A selection of them is found in Table 3.2.9.2.

48 Briefly discussed in 2.3.4, these matters, both in private contracts and other commercial laws and instruments are highly complex and relatively far beyond the scope of this book.

Table 3.2.9.2 Data-sharing procedures, and other reports, consultation and inspection regarding activities under the contract

Contract No.	Data-sharing procedures, and other reports, consultation and inspection regarding activities under the contract
1	At the latest of 12 (twelve) months after receipt of the extracts, the [Commercial User] shall inform the [University in Provider Country] about the preliminary biological results of the testing and its decision to continue or discontinue the biological programs.
2	'INTERESTED PARTY' will provide _____ (number) progress reports on the results of the investigation that involves the material received, on a _(insert period of regularity)___ basis
4	The LICENSEE shall on or before the 30th day of July of each calendar year during the term hereof and any renewal, submit to LICENSOR written reports as to the LICENSEE's activities with respect to the VARIETY during the preceding twelve months. Such reports shall contain: (i) a description of the steps taken by the LICENSEE to develop and market the VARIETY; (ii) a description of the marketing conditions for the VARIETY; (iii) n audited statement including the tonnage of the VARIETY sold by the LICENSEE, and amount of royalties payable; (iv) an audited statement including the names and addresses of all sub-licenses to whom the VARIETY has been sub-LICENSED, a full account of all revenues generated by such sub-licenses, including the number of tonnes of VARIETY sold, and a calculation of the amount due to COUNTRY for the royalties stipulated herein; and (v) a remittance to LICENSOR payable to the Receiver General for LICENSOR of the amount of royalties so payable
6	USER shall send two copies of the final results of the investigation and bioprospecting products, and of the scientific articles and publications that are derived from them, and shall in all cases recognize the contribution of the country and of the knowledge associated to the resource or resources. One of these copies will be given to the TECHNICAL OFFICE, and another one to the AGENCY. In the case in that the any bioprospecting or investigation is undertaken in lands of third parties, copies shall be provided as follows: One to the TECHNICAL OFFICE, one to the National Conservation Area System, and one to the owner of the Building or other specific provider, identified according to [national legislation.]
12	The Recipient shall send to the Provider the progress and final report of the work that the Biological material has been provided for.
19	AGENCY shall keep complete, true, and accurate accounts of all Expenses and of all Net Revenues received by it from each licensee of the 'Patent Rights' defined in this agreement. Upon request by the INSTITUTION AGENCY shall submit to the Institution a report setting forth the status of all patent prosecution, commercial development, and licensing activity relating to the Patent Rights for the preceding calendar year.
	AGENCY shall submit to the INSTITUTION annual statements of itemized Expenses and may, at its sole discretion, elect to either: 1) deduct Recoverable Costs prior to the distribution of Net Revenues pursuant to Article 6.1 of this Agreement, or 2) directly invoice or have its contract attorneys or other agents of the AGENCY directly invoice the INSTITUTION for Recoverable Costs contemporaneous to their generation. If the INSTITUTION has identified discrepancies in billing by AGENCY deduction of the contested item from Net Revenues may be delayed pending resolution thereof. In the case of 2) above, the INSTITUTION shall pay within sixty (60) days of receiving an invoice. In addition, AGENCY shall upon execution of the Agreement submit to the INSTITUTION a statement of Expenses incurred prior to the execution date of this Agreement.
22	LICENSEE agrees to make written reports to AGENCY within sixty (60) days after the end of each calendar year. These reports shall include, but not be limited to, progress on the research and development involving the Materials and use of the Materials
23	LICENSEE agrees to make written reports to AGENCY within sixty (60) days after the end of each calendar year. This report shall state the number, description, and aggregate Net Sales of Licensed Products made, sold, or otherwise disposed of, and the total gross income received by Licensee from leasing, renting, or otherwise making Licensed Products available to others without sale or other disposition transferring title, during such completed calendar year, and resulting calculation pursuant to Paragraph 4 of payment due. LICENSEE shall submit each such report along with payment due AGENCY for the calendar year covered by the report to AGENCY at the address listed in Paragraph 4 above and shall also send a copy of the report to AGENCY at the Mailing Address for Notices indicated on the Signature Page of this Agreement
	LICENSEE agrees to supply the laboratory of [Person designated by AGENCY] at no charge reasonable quantities of Materials and Licensed Products that LICENSEE makes, uses, sells, or offers for sale or otherwise makes available for public use
24	LICENSEE agrees to submit in confidence a final report to AGENCY within thirty (30) days of termination or expiration of this Agreement outlining in general its results of commercial evaluation of the Licensed Patent Rights, the Licensed Products, and the Materials provided by this Agreement.
26	AGENCY agrees to take responsibility for, but to consult with, the LICENSEE in the preparation, filing, prosecution, and maintenance of any and all patent applications or patents included in the Licensed Patent Rights and shall furnish copies of relevant patent-related documents to LICENSEE
28	RECIPIENT agrees to report feedback and performance/evaluation information on the germplasm to PROVIDER
29	If one of the parties is required under this Agreement to provide duplicates of repatriated agricultural biodiversity to a third party, the other party will be notified of this transaction.

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Table 3.2.9.2 Data-sharing procedures, and other reports, consultation and inspection regarding activities under the contract (continued)

Contract No.	Data-sharing procedures, and other reports, consultation and inspection regarding activities under the contract
30	The RECIPIENT will report in writing to PROVIDER every 90 days providing details of progress with, and the results of the Approved Research, and PROVIDER will keep such results confidential, subject to PROVIDER's rights described in this Agreement. Each report must set out the progress of the Approved Research since the last report and anticipated activities during the next reporting period, and describe any Intellectual Property arising from the Approved Research.
	The RECIPIENT will provide PROVIDER with the Results, assessment of data, samples as reasonably requested, and provide PROVIDER with reasonable assistance in their assessment or interpretation
	Within 90 days of the conclusion of the Approved Research the RECIPIENT will provide PROVIDER with a final written report setting out the Results, and certifying compliance with the RECIPIENT's obligations as set out in this Agreement.
33	PROVIDER shall maintain books of account and original receipts for all amounts spent pursuant to this Agreement and shall make those books of account and receipts or notarized copies thereof, available to RECIPIENT for auditing purposes.
	The PROVIDER shall have the right, for two years after any royalty payment, to verify that the royalty payment satisfies the requirements of this agreement, as follows: at the request and expense of PROVIDER, RECIPIENT shall permit independent public accountants selected by PROVIDER and approved by RECIPIENT (and reasonably acceptable to RECIPIENT) access to such books and records of RECIPIENT as are required to verify that the royalty payment(s) in question were calculated accurately and in conformance with the provisions of this Agreement. RECIPIENT's books and records subject to review pursuant to this provision shall not be revealed to PROVIDER, and PROVIDER shall causes said accountants to regain all such information in confidence during the term of this Agreement and for a period of 5 years thereafter.
	RECIPIENT shall report annually in writing to PROVIDER on the screening and research and development relating to samples provided under this Agreement, as well as the performance of any other obligations of RECIPIENT under this Agreement. The report shall adequately identify samples screened, the highest stage of R&D which each sample was taken as of that writing, and a summary of R&D findings, as well as a financial summary of payments made to PROVIDER, payments for IPRs, net sales, royalties, and any commercial applications of any Product (as defined) being developed.
39	AT the beginning of each contract year, COMPANY will provide PROVIDER with a confidential written list of the therapeutic areas in which COMPANY intends to evaluate Samples. COMPANY will provide a confidential written disclosure to PROVIDER reporting all data on a sample-by-sample basis of all non proprietary (i.e., in the public domain) biological screens, assays and tests applied by COMPANY to the SAMPLES. Such disclosure will also summarize the results of the screens, assays and tests, by therapeutic area, as 'active' or 'inactive' and sill include the number of biological screens utilized during that period.]
	COMPANY will provide a confidential written notice to PROVIDER as soon as possible after receipt of a sample, as to whether COMPANY has determined in good faith that it has no continuing interest in it (inactive) or if the sample is of continuing interest (active). Failure to provide such notice with respect to any Sample shall be deemed notice that COMPANY has deemed the Sample inactive. In such case PROVIDER will communicate in writing to inform COMPANY that it assumes the Sample is inactive.
	COMPANY will promptly notify PROVIDER if COMPANY determines not to continue research testing or further commercialisation of an active extract – thereby converting it to an ‚inactive extract.'
	With each semi-annual payment [of royalties due], COMPANY shall deliver to PROVIDER a full and accurate accounting to include at least the following information: (a) quality of each Product sold by COMPANY and its affiliates, licensees or sublicensees; (b) total billings for each Product by country; (c) quantities of the Product used by COMPANY and its affiliates, licensees or sublicensees, or sold to the [user country] Government; and (d) total royalties payable.
40	Periodic conferences shall be held between the Parties for the purpose of reviewing the progress of such work. It is understood that the nature of this research is such that completion within the period of performance specified or within the limits of financial support allocated, cannot be guaranteed. Accordingly all research will be performed in good faith.
	The Parties shall prepare reports of the results of work under this Agreement in accordance with the Scope of Work and such reports will be used to compile the quarterly and annual reports of the group using the Guidelines provided by PROJECT and
41	At the beginning of each contract year, COMPANY will provide PROVIDER with a confidential written list of the therapeutic areas in which Extracts will be screened. Such notice will summarize the results of all COMPANY screens by therapeutic area, and reporting all screening data on all Extracts tested in COMPANY's non-proprietary (e.g., in the public domain) screens.
42	UNIVERSITY [through a specifically individual] shall prepare a written report to be submitted to SPONSORING AGENCY in format and frequency to be specified. [Another individual at] UNIVERSITY will prepare a written report to be submitted to the Parties, on the progress of the project.... The UNIVERSITY will convene a meeting of the designated primary investigators from all Parties to this Agreement on an annual basis.

Table 3.2.9.2 Data-sharing procedures, and other reports, consultation and inspection regarding activities under the contract (continued)

Contract No.	Data-sharing procedures, and other reports, consultation and inspection regarding activities under the contract
42 cont.	COMPANY shall notify the Parties whenever it decides to proceed with the development of any compound derived from plants supplied pursuant to this Agreement. In the event of a decision not to proceed with the development of a compound, the COMPANY and other Parties shall discuss in good faith alternative methods of commercialization of such compound with a view to maximizing the value in such compounds. Such discussion shall include, where appropriate, suitable remuneration to COMPANY based on the respective contribution of COMPANY and other Parties.
43	If during the term of this Agreement, any Party shall obtain or develop any information regarding hazards associated with sample extracts for compounds licensed to COMPANY under this Agreement or any substances or compounds contained in Sample extracts or any requirements for special handling, it shall promptly inform the other Parties. Inclusion of such information in the publications contemplated under this agreement shall be automatically permitted by all Parties.
SMTA	The PROVIDER shall periodically inform the GOVERNING BODY about the Material Transfer Agreements entered into, according to a schedule to be established by the Governing Body. This information shall be made available by the GOVERNING BODY to the third party beneficiary
	The third party beneficiary has the right to request that the appropriate information, including samples as necessary, be made available by the PROVIDER and the RECIPIENT, regarding their obligations in the context of this Agreement. Any information or samples so requested shall be provided by the PROVIDER and the RECIPIENT, as the case may be.
	On the first anniversary of the effective date of this Agreement, and each subsequent anniversary, PROVIDER shall cooperate with RECIPIENT to describe to the public the progress of screening and R&D relating to Samples provided under this Agreement. This report shall include the most recently updated environmental assessment of these activities.
Powers to inspect or obtain further information	
3	Throughout the time of this Agreement, the PRODUCTEUR will be in regular contact with staff of the PROPRIÉTAIRE, who will provide technical advice and training, and ensure that the PRODUCTEUR performs to the farming and technical standards envisaged by present contract PRODUCTEUR will implement the suggestions of the Project, including ripeness for harvest, and methods of drying, beating and bagging. The produced seeds will be subjected to tests of germination to determine the quality of the work. Only the seeds which satisfy the standards prescribed with the present contract will be weighed and delivered by PROPRIÉTAIRE.
4	The LICENSEE agrees, at the request of LICENSOR, to permit an independent public accountant retained by LICENSOR to inspect all the aforementioned records in order to ascertain the accuracy of such royalties and reports. The auditing and verification provisions herein shall extend for 10 years following the expiry or earlier termination of this License Agreement In the event of any discrepancy uncovered by the audit in excess of 5% of the amount payable, the LICENSEE shall pay forthwith to LICENSOR both the cost of the audit as well as the discrepancy in funds. (Assuming the Licensee statement of payable is lower than what the audit shows is payable.) If the audit shows LICENSOR received more than is payable, LICENSOR shall forthwith pay the LICENSEE the amount due.
6	During the operation of this Agreement, the employees of the TECHNICAL OFFICE or to the members of the AGENCY shall have access to USER for the purpose of verifying and controlling implementation of the permit and this agreement, as established in accordance with [specific national biodiversity legislation
19	AGENCY shall permit the INSTITUTION or the INSTITUTION‘s designated agent to examine its books and records in order to verify the payments due or owed under this Agreement
26	LICENSEE agrees to keep accurate and correct records of Licensed Products made, used, sold, or imported and Licensed Processes practiced under this Agreement appropriate to determine the amount of royalties due AGENCY. Such records shall be retained for at least five (5) years following a given reporting period and shall be available during normal business hours for inspection at the expense of AGENCY by an accountant or other designated auditor selected by AGENCY for the sole purpose of verifying reports and payments hereunder. The accountant or auditor shall only disclose to AGENCY information relating to the accuracy of reports and payments made under this Agreement. If an inspection shows an underreporting or underpayment in excess of five percent (5%) for any twelve (12) month period, then Licensee shall reimburse AGENCY for the cost of the inspection at the time LICENSEE pays the unreported royalties. All payments required under this Paragraph shall be due within thirty (30) days of the date AGENCY provides LICENSEE notice of the payment due
	LICENSEE agrees to have an audit of sales and royalties conducted by an independent auditor at least every two (2) years if annual sales of the Licensed Product or Licensed Processes are over two (2) million dollars. The audit shall address, at a minimum, the amount of gross sales by or on behalf of LICENSEE during the audit period, terms of the license as to percentage or fixed royalty to be remitted, and whether the royalty amount owed has been paid and is reflected in the records of the LICENSEE The audit shall also indicate the AGENCY license number, product, and the time period being audited. A report certified by the auditor shall be submitted promptly by the auditor directly to AGENCY on completion. LICENSEE shall pay for the entire cost of the audit.

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Table 3.2.9.2 Data-sharing procedures, and other reports, consultation and inspection regarding activities under the contract (continued)

Contract No.	Data-sharing procedures, and other reports, consultation and inspection regarding activities under the contract
26 cont.	Prior to signing this Agreement, LICENSEE has provided to AGENCY the Commercial Development Plan at Appendix F, under which LICENSEE intends to bring the subject matter of the Licensed Patent Rights to the point of Practical Application. This Commercial Development Plan is hereby incorporated by reference into this Agreement. Based on this plan, performance Benchmarks are determined as specified in Appendix E.
	LICENSEE shall provide written annual reports on its product development progress or efforts to commercialize under the Commercial Development Plan for each of the Licensed Fields of Use within sixty (60) days after December 31 of each calendar year. These progress reports shall include, but not be limited to: progress on research and development, status of applications for regulatory approvals, manufacturing, sublicensing, marketing, importing, and sales during the preceding calendar year, as well as plans for the present calendar year. AGENCY also encourages these reports to include information on any of LICENSEE's public service activities that relate to the Licensed Patent Rights. If reported progress differs from that projected in the Commercial Development Plan and Benchmarks, LICENSEE shall explain the reasons for such differences. In any such annual report, LICENSEE may propose amendments to the Commercial Development Plan, acceptance of which by AGENCY may not be denied unreasonably. LICENSEE agrees to provide any additional information reasonably required by AGENCY to evaluate LICENSEE's performance under this Agreement. LICENSEE may amend the Benchmarks at any time upon written consent by AGENCY. AGENCY shall not unreasonably withhold approval of any request of LICENSEE to extend the time periods of this schedule if such request is supported by a reasonable showing by LICENSEE of diligence in its performance under the Commercial Development Plan and toward bringing the Licensed Products to the point of Practical Application. LICENSEE shall amend the Commercial Development Plan and Benchmarks at the request of AGENCY to address any Licensed Fields of Use not specifically addressed in the plan originally submitted.
	LICENSEE shall report to AGENCY the dates for achieving Benchmarks specified in Appendix E and the First Commercial Sale in each country in the Licensed Territory within thirty (30) days of such occurrences.
	LICENSEE shall submit to AGENCY within sixty (60) days after each calendar half-year ending June 30 and December 31 a royalty report setting forth for the preceding half-year period the amount of the Licensed Products sold or Licensed Processes practiced by or on behalf of LICENSEE in each country within the Licensed Territory, the Net Sales, and the amount of royalty accordingly due. With each such royalty report, LICENSEE shall submit payment of the earned royalties due. If no earned royalties are due to AGENCY for any reporting period, the written report shall so state. The royalty report shall be certified as correct by an authorized officer of LICENSEE and shall include a detailed listing of all deductions made hereunder to determine Net Sales made, and thus to determine royalties due.
	LICENSEE agrees to forward semi-annually to AGENCY a copy of such reports received by LICENSEE from its SUBLICENSEES during the preceding half-year period as shall be pertinent to a royalty accounting to AGENCY by LICENSEE for activities under the sublicense.
	Interest and penalties may be assessed by AGENCY on any overdue payments in accordance with the Federal Debt Collection Act. The payment of such late charges shall not prevent AGENCY from exercising any other rights it may have as a consequence of the lateness of any payment.
39	COMPANY shall keep and shall cause each of its affiliates, licensees or sublicensees to keep full and accurate books of accounting containing all particulars that may be necessary for the purpose of calculating royalties payable. Such books of account shall be kept at their principle place of business and, with all necessary supporting data, shall be open for inspection once for each relevant calendar year by an independent certified accountant selected by PROVIDER, as to which COMPANY has no reasonable objection. PROVIDER shall bear all costs of the inspection, including the fee of the accountant. Such inspection may occur at any reasonable time for 3 years following the end of the calendar year to which they pertain.
	COMPANY shall maintain a system that can provide details of the progression of each Sample during the Samples tenure at COMPANY. A report of such details shall be provided by COMPANY to PROVIDER upon reasonable request.
46	The ACCESS PARTY will maintain complete, accurate and up to date accounts and records in relation to this Instrument, including appropriate audit trails for transactions performed, and separate record of all receipts. Records shall be kept in a manner that permits them to be conveniently and properly accessed and audited; and shall be drawn in accordance with generally accepted accounting practices and standards. The ACCESS PARTY accounts and records will enable tracking of Exploitation Revenue to ensure correct delivery of Threshold Payments to the Access Provider. The accounts and records required under this instrument shall be maintained for a period of 7 years following the expiration or termination of this Instrument
	The ACCESS PARTY will give to the ACCESS PROVIDER, or to any persons authorised in writing by the ACCESS PROVIDER, access to premises occupied by the ACCESS PARTY and shall permit those persons to participate in audits, inspect and take copies of any Material relevant to this Instrument, subject to the provision of reasonable prior notice of such audit, reasonable security procedures, and compliance with all confidentiality provisions in this Instrument. The audit shall not unreasonably interfere with the ACCESS PARTY's performance under this Instrument in any material respect.

In this connection, it may be useful to recall the Bonn Guidelines, which note the following, in relation to reporting:

> *Parties should endeavour to establish mechanisms to promote accountability by all stakeholders involved in access and benefit-sharing arrangements…. To promote accountability, Parties may consider establishing requirements regarding: (a) reporting; and (b) disclosure of information. … The individual collector or institution on whose behalf the collector is operating should, where appropriate, be responsible and accountable for the compliance of the collector.*[49]

3.2.9.3 'Boilerplate' and contract formalities

Finally, it is notable that many provisions are so common in contracts that they are commonly called 'boilerplate' meaning that Parties do not read them, and may include them without seriously considering their content. Despite their frequent appearance, however, 'boilerplate' provisions are included for very serious legal purposes, and the Parties are strongly encouraged to determine their legal and practical meaning, and to carefully analyze how they might be different in ABS situations from their normal use in more conventional contracts.[50]

Table 3.2.9.3 offers a relatively broad sampling of 'boilerplate provisions' found in the contracts reviewed for this book. The author has not reproduced all such measures, leaving out for example those that state the processes of payment and other matters which can be easily understood and negotiated.

Table 3.2.9.3 A few examples of 'boilerplate'

Some examples of 'boilerplate'
Entire AGREEMENT: This AGREEMENT constitutes the entire agreement between the PARTIES. This AGREEMENT sets forth all representations forming part of or in any way affecting or relating to the LICENSE AGREEMENT. The PARTIES acknowledge that there are no representations either oral or written, between the LICENSEE and COUNTRY other than those expressly set out in the LICENSE AGREEMENT. This AGREEMENT supersedes and revokes all negotiations, arrangements, letters of intent, offers, proposals, brochures, representations and information conveyed, whether oral or in writing, between the PARTIES hereto or their respective representatives or any other person purporting to represent the LICENSEE or Country. The PARTIES agree that none has been induced to enter into this AGREEMENT by any representations not set forth in this AGREEMENT; none has relied on any such representations; no such representations shall be used in the interpretation or construction of this AGREEMENT; no claims for any damages arising as a result of, or from, any such representations shall accrue to or be pursued by the PARTIES and no PARTY shall have any liability for any such claims; and the LICENSEE has conducted its own due diligence examination and has satisfied itself of the full and plain disclosure of all the material facts.
No Adverse Presumption in Case of Ambiguity: There shall be no presumption that any ambiguity in this AGREEMENT be resolved in favour of either of the PARTIES. For greater certainty, the contra proferentum rule shall not be applied in any interpretation of the LICENSE AGREEMENT.
Severability: If any part of this AGREEMENT is declared or held invalid for any reason, the invalidity of that part will not affect the validity of the remainder which will continue in full force and effect and be construed as if this AGREEMENT had been executed without the invalid portion. The intention of the PARTIES is that this AGREEMENT would have been executed without reference to any portion which may, for any reason, be declared or held invalid.
Successors in Interest: This AGREEMENT will be for the benefit of and be binding upon the heirs, executors, administrators, successors, permitted assigns of the LICENSEE and other legal representatives, as the case may be, of each of the PARTIES. Every reference in this AGREEMENT to any PARTY includes the heirs, executors, administrators, successors, permitted assigns and other legal representatives of the PARTY.
Minister Not Fettered: Nothing in this AGREEMENT shall derogate or otherwise fetter the ability of COUNTRY to regulate, administer, manage or otherwise deal with agriculture and all attendant matters thereto.
Not a Joint Venture: The PARTIES expressly disclaim any intention to create a partnership, joint venture or joint enterprise. The PARTIES acknowledge and agreed that nothing contained in this AGREEMENT nor any acts of any PARTY shall constitute or be deemed to constitute the PARTIES as partners, joint venturers or principal and agent in any way or for any purpose; no PARTY has the authority to act for or to assume any obligation or responsibility on behalf of any other PARTY; and the relationship between the PARTIES is that of licensor and licensee.
Federal Legislation: The reference in this AGREEMENT to any Federal act or regulation includes any subsequent amendment, revision, substitution, consolidation to that act or regulation, notwithstanding that such amendment, revision or substitution occurred after the execution of the LICENSE AGREEMENT or may have a retroactive effect.

continued on next page

49 Bonn Guidelines at Arts. 52-54.

50 The authors do not wish to imply that there is any 'standard' for any of these provisions. Contractual lawyers will negotiate and revise them in every transaction, to suit the legal need and negotiated rights of the parties.

Table 3.2.9.3 A few examples of 'boilerplate' (continued)

Some examples of 'boilerplate'
Right to Legislate: Nothing in this AGREEMENT shall prohibit, restrict or affect the right or power of the Parliament of Country to enact any laws whatsoever with respect to any area of law for which the Parliament of Country has legislative jurisdiction, even if the enactment of any such law affects this AGREEMENT, its interpretation or the rights of either PARTY.
No Implied Obligations: No implied terms or obligations of any kind by or on behalf of either of the PARTIES shall arise from anything in this AGREEMENT. The express covenants and agreements herein contained and made by the PARTIES are the only covenants and agreements upon which any rights against either of the PARTIES may be founded.
Contract Always Speaks: Where a matter or thing is expressed in the present tense, it shall be applied to the circumstances as they arise, so that effect may be given to this AGREEMENT according to its true spirit, intent and meaning.
Headings: All headings in this AGREEMENT have been inserted as a matter of convenience and for reference only and in no way define, limit, enlarge, modify the scope or meaning of this AGREEMENT or any of its provisions. Any reference in this AGREEMENT to an Article, paragraph, subparagraph will mean an Article, paragraph or subparagraph of this AGREEMENT unless otherwise expressly provided.
Appendices: The document attached hereto as Appendix 'A' forms an integral part of this AGREEMENT as fully as if it were set forth herein in extenso, and consists of: Appendix 'A' - Description of the VARIETY
Amendments: No modification, or waiver of any provision of this AGREEMENT will be inferred from anything done or omitted by either of the PARTIES except by an express amendment in writing duly executed by the PARTIES.
Waiver: No condoning, excusing or overlooking by either of the PARTIES of any default by the other PARTY at any time or times in performing or observing any of the PARTIES respective covenants will operate as a waiver of or otherwise affect the rights of the PARTIES in respect of any continuing or subsequent default. No waiver of these rights will be inferred from anything done or omitted by the PARTIES except by an express waiver in writing. For greater clarity, the failure by either of the PARTIES or their authorized representatives, as the case may be, to require the fulfilment of these obligations, or to exercise any rights herein contained shall not constitute a waiver, a renunciation or a surrender of those obligations or rights.
Remedies Cumulative: All rights and remedies of the PARTIES are cumulative and are in addition to and do not exclude any other right or remedy provided in this AGREEMENT or otherwise allowed by law.
Mutual Assistance: The PARTIES will at all times hereafter upon every reasonable request of the other make, do and execute or cause to be procured, made, done and executed, all such further acts, deeds and assurances for the carrying out of the terms, covenants and agreements of this AGREEMENT according to the true intent and meaning of this AGREEMENT.
Time is of the Essence: Time shall be of the essence in this AGREEMENT.
No Bribes: The LICENSEE warrants that no bribe, gift, or other inducement has been paid, given, promised or offered to any Government official or employee for the obtaining of this LICENSE AGREEMENT.
No Share to Members of Parliament: Pursuant to the [specific legislative citation], no member of the House of Commons or Senate will be admitted to any share or part of this AGREEMENT or to any benefit to arise from this AGREEMENT.
Public Office Holders: It is a term of this AGREEMENT that no former public office holder who is not in compliance with the post employment provisions of the [national law preventing conflicts of interests in government officials] shall derive a direct benefit from this AGREEMENT.
NO WARRANTEE or REPRESENTATION regarding Hazards or Merchantability/Fitness: Any Material delivered pursuant to this Agreement is understood to be experimental in nature and may have hazardous properties. The PROVIDER MAKES NO REPRESENTATIONS AND EXTENDS NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR THAT THE USE OF THE MATERIAL WILL NOT INFRINGE ANY PATENT, COPYRIGHT, TRADEMARK, OR OTHER PROPRIETARY RIGHTS.
Individual Liability for Activities: Except to the extent prohibited by law, the RECIPIENT assumes all liability for damages, which may arise from its use, storage or disposal of the MATERIAL. The PROVIDER will not be liable to the RECIPIENT for any loss, claim or demand made by the RECIPIENT, or made against the RECIPIENT by any other party, due to or arising from the use of the MATERIAL by the RECIPIENT, except to the extent permitted by law when caused by the gross negligence or willful misconduct of the PROVIDER.
No Partnership: Nothing in this Agreement shall be deemed to create and agency, joint venture or partnership between the parties hereto.
Parties as Independent Contractors: The relationship of the Parties to this Agreement is that of independent contractors and not as agents of each other or as joint venturers or partners.

In addition to these, as noted in 2.3, the 'formalities' by which the contract is signed and the Parties commitment is otherwise documented may also be very important. The SMTA, at article 10 provide a number of different approaches to documentation of the contract.

3.2.10 Compliance provisions: Addressing enforcement of the legal rights of the parties

The last category of provisions presented in this Part address compliance issues – specifically, dispute resolution and enforcement. These are highly 'legal' issues, which are found in all contracts but may be specially affected by the nature of ABS. Some factors that may make ABS compliance difficult under contracts include the collaborative nature of the ABS process (the fact that contracts are negotiated by consensus between a commercially sophisticated user and a less commercially experienced provider), the fact that government and third-parties may have other legally protected interests in the subject matter that are not addressed by the contract, and the internationality of ABS contracts. As a result, compliance provisions and their enforcement are very difficult in ABS situations, where only one party has continuing control over information, while other parties may have specific expectations regarding what should be happening, and what benefits should be expected. The clarification of enforcement, responsibility and legal rights issues is thus a very important element of legal certainty for both parties.

3.2.10.1 Dispute resolution

Contracts reviewed for this book contain numerous types of provisions relating to dispute resolution. As shown in the examples in Table 3.2.10.1, these provisions come in four types: (i) contractual resolution provisions (liquidated damages clauses), (ii) informal resolution (attempts to seek consensus through negotiation, including facilitated negotiation); (iii) alternative resolution (arbitration, mediation and similar processes), and (iv) judicial process. Although many contracts do not discuss all four types of dispute resolution, all four may be applicable to any contract, even one which says otherwise. (For example, a contract that says that formal judicial process may not be used, may still be reviewed by a court.)[51]

Table 3.2.10.1 Levels of dispute resolution

Contract No.	Levels of dispute resolution
Contractual Dispute Resolution (liquidated damages and immediate remedies)	
3	In the event that either party fails to meet his substantive obligations under this contract (such as obtaining prior agreement the neighbors in the event of need for insulation of the ground, the supply of seeds of the male parents and manure to the neighbors of the producer, the supply of seeds to the producer, the payment of the advances, the refusal to apply the technical standards, and the abandonment of the activities), the contract can be terminated by 48-hours notice by the non-defaulting party to the defaulting party. If the defaulting party is PRODUCTEUR, he must refund with the other the amount of the advances received as well as the monetary value of the seeds and the manure provided by the PRODUCTEUR. If the defaulting Party is the PRODUCTEUR, it must refund to the PRODUCTEUR the estimated financial equivalent of the additional workload caused in proportion to the work completed by the PRODUCTEUR as of that date. In the event that the termination is not caused by default, but by some the cause beyond the Parties' control, i.e. any unforeseeable and or insurmountable event preventing the normal execution of this contract by one of the parties, that Party is not required to provide such reimbursement.
33	If PROVIDER fails to supply RECIPIENT with the agreed-upon quantity of samples in a particular year, RECIPIENT may reduce the annual budget for the following contract year by an amount prorated to the shortfall of the supply of samples in the preceding contract year.
Informal Dispute Processes (Guarantee, surety, escrow, etc.)	
3	Any disputes born out of the execution of this contract will be resolved informally, except….
6	In the event of any dispute arising out of the execution of this Framework Agreement, the parties will attempt to resolve the matter by non-legal means, to the extent possible.
17	In the event that AGENCY, the INSTITUTION or their licensees, learns of the substantial infringement of any patent subject to this Agreement, he shall promptly notify the other party in writing and provide the other party with all available evidence of infringement. AGENCY and its licensees shall use their best efforts to eliminate such infringement without litigation. If these efforts are not successful within ninety (90) days after the infringing party has been formally notified of the infringement, AGENCY shall have the right, after consulting with the INSTITUTION to commence a lawsuit. The INSTITUTION may commence its own suit after consultation with AGENCY. AGENCY may permit its licensees to bring suit on their own account, and AGENCY shall retain the right to join any licensee's suit.

continued on next page

51 Klimas, 2006; Lord 1997; Marsh, 1994.

TABLE 3.2.10.1 Levels of dispute resolution (continued)

Contract No.	Levels of dispute resolution
19	Any controversy or any disputed claim by either party against the other arising under or related to this Agreement shall be submitted jointly to the INSTITUTION President and to the Director of the [Governmental unit directly responsible for AGENCY], or designee for resolution. The INSTITUTION and AGENCY will be free after written decisions are issued by those officials to pursue any and all administrative and/or judicial remedies which may be available
29	Both parties agree to establish conflict resolution procedures within six months of signature of this Agreement. These procedures shall be mutually agreed by the two parties and shall as far as possible reflect normal conflict resolution principles. The relevant document shall be annexed to this Agreement
30	If a dispute arises out of or related to this Agreement no party may commence court or arbitration proceedings (other than proceedings for urgent interlocutory relief) unless it has complied with this clause. A party to this Agreement claiming that a dispute has arisen under or in relation to this Agreement must give written notice to the other party specifying the nature of the dispute. On receipt of that notice by the other party the parties' representatives must endeavour in good faith to resolve the dispute expeditiously and failing agreement within 30 days must commence use informal dispute resolution techniques such as mediation, expert evaluation or determination or similar techniques agreed to by them.
33	In the event of any dispute under this Agreement between RECIPIENT and PROVIDER, the parties shall negotiate or resort to mediation, in good faith
40	Any dispute arising under this Agreement which is not disposed of by agreement of the [specific individuals] shall be submitted jointly to the persons signing this agreement on behalf of the Parties to this Agreement. A joint decision of these persons or their designees shall be the disposition of this dispute
41	Disputes under this contract shall be resolved through a good faith mechanism. For these purposes, the term 'good faith' shall mean [provision redacted by parties]
42	The parties shall endeavor to resolve disputes by peaceful means.
SMTA	Amicable dispute settlement: The parties shall attempt in good faith to resolve the dispute by negotiation.
Alternative Dispute Resolution	
1	All disputes arising in connection with the present Agreement shall be finally settled under the Rules of Conciliation and Arbitration of the home city of the COMPANY.
2	In case of breach or other disputes arising under this contract, by any party(ies), such parties shall submit the case to [designated body] to apply/interpret the effective norm.
4	Any dispute or difference between the parties hereto arising under this License Agreement which involves only a question of fact may be referred to an arbitration tribunal for an award and determination by written submission signed by either LICENSOR or the LICENSEE. The parties hereto agree that the award and determination of the arbitration tribunal shall be final and binding on both parties hereto. The arbitration tribunal shall be governed by [national legislation on commercial arbitration].
	The arbitration tribunal shall consist of three (3) arbitrators, one (1) appointed by each of the parties hereto and the third appointed by the first two (2) arbitrators. The arbitration tribunal shall decide the dispute or difference in accordance with the laws in force in the [national jurisdictional area]. The arbitration tribunal shall be authorized to decide ex aequo et bono or as amiable compositeur.
	The proceedings shall take place in the [district in country in which arbitration shall be held], unless the parties hereto agree otherwise. The language to be used in the proceedings is English, unless the parties hereto agree otherwise. During the progress of arbitration, the parties hereto shall continue to perform their obligations under this License Agreement
12	Any dispute between the parties regarding interpretations of this Agreement which cannot be resolved by negotiation shall be arbitrated according to the provisions of this Agreement by a mutually acceptable non-party attorney.
30	If the parties do not agree within 30 days of receipt of the notice referred to in this clause, dispute resolution technique and procedures shall be adopted, either by agreement of the Parties, or failing that, then the parties must mediate the dispute using the and the President of the Law Society of the Territory of the PROVIDER or the President's nominee will select the mediator and determine the mediator's remuneration. The mediator will determine the procedure for the mediation
33	If efforts at informal resolution fail, arbitration shall be the exclusive means of resolving disputes under this agreement. Arbitration shall be conducted under the arbitration rules of the United Nations Commission on International Trade Law. The language(s) of the arbitration shall be [the official language of user country, and the official language of provider's country]. The place of the arbitration shall be [the town in which RECIPIENT's university is located] The decision of the arbitration panel shall be final.

Table 3.2.10.1 Levels of dispute resolution (continued)

Contract No.	Levels of dispute resolution
35	If efforts at informal resolution fail, arbitration shall be the exclusive means of resolving disputes under this agreement. Arbitration shall be conducted under the arbitration rules of the United Nations Commission on International Trade Law. The language(s) of the arbitration shall be [the official language of user country, and the official language of provider's country]. The place of the arbitration shall be [the town in which RECIPIENT's university is located] The decision of the arbitration panel shall be final.
40	If the dispute still cannot be resolved, the parties and those otherwise bound by the terms of this Agreement, hereby consent to arbitration as the exclusive means of dispute resolution, pursuant to national law of the user country, specified in detail.]
42	The International Chamber of Commerce shall have exclusive jurisdiction in judicial matters and the English version (of the contract) shall prevail.
SMTA	Dispute settlement may be initiated by the PROVIDER or the RECIPIENT or the (the entity designated by the GOVERNING BODY), acting on behalf of the GOVERNING BODY.
	The... third party beneficiary has the right, to initiate dispute settlement procedures regarding rights and obligations of the PROVIDER and the RECIPIENT under this Agreement.
	The third party beneficiary has the right to request that the appropriate information, including samples as necessary, be made available by the PROVIDER and the RECIPIENT, regarding their obligations in the context of this Agreement. Any information or samples so requested shall be provided by the PROVIDER and the RECIPIENT, as the case may be.
	If the dispute is not resolved by negotiation, the parties may choose mediation through a neutral third party mediator, to be mutually agreed.
	If the dispute has not been settled by negotiation or mediation, any party may submit the dispute for arbitration under the Arbitration Rules of an international body as agreed by the parties to the dispute. Failing such agreement, the dispute shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce, by one or more arbitrators appointed in accordance with the said Rules. Either party to the dispute may, if it so chooses, appoint its arbitrator from such list of experts as the GOVERNING BODY may establish for this purpose; both parties, or the arbitrators appointed by them, may agree to appoint a sole arbitrator, or presiding arbitrator as the case may be, from such list of experts. The result of such arbitration shall be binding.
Judicial Action	
3	Any disputes born out of the execution of this contract will be resolved informally, except with regard to any attempt by the PRODUCER to withdraw seeds (directly or indirectly), to produce the same varieties of seeds for commercial purposes outside of this contract (whether directly or indirectly), or to the use of name [name of the variety provided to PRODUCER] in (directly or indirectly) offering similar seeds for sale. In the event of dispute over one of these listed exceptions, the litigation will be subjected to the qualified judicial bodies in accordance with the dispute on the rights of ownership and of invention.
17	In the event that AGENCY, the INSTITUTION or their licensees, learns of the substantial infringement of any patent subject to this Agreement, he shall promptly notify the other party in writing and provide the other party with all available evidence of infringement. AGENCY and its licensees shall use their best efforts to eliminate such infringement without litigation. If these efforts are not successful within ninety (90) days after the infringing party has been formally notified of the infringement, AGENCY shall have the right, after consulting with the INSTITUTION to commence a lawsuit. The INSTITUTION may commence its own suit after consultation with AGENCY. AGENCY may permit its licensees to bring suit on their own account, and AGENCY shall retain the right to join any licensee's suit.
	The Institution shall take no action to compel AGENCY either to initiate or to join in any suit for patent infringement. Should the GOVERNMENT be made a party to any such suit by motion or any other action of the INSTITUTION the INSTITUTION shall reimburse the GOVERNMENT for any costs, expenses, or fees which the GOVERNMENT incurs as a result of such motion or other action, including any and all costs incurred by AGENCY in opposing any such joinder action. Legal action or suits to eliminate infringement and/or recover damages pursuant to Paragraph 8.1 shall be at the full expense of the party by whom suit is brought. All damages recovered thereby shall first be used to reimburse each party for their expenses in connection with such legal action, and the remainder of such damages shall be considered Net Revenues. Each party agrees to cooperate with the other in litigation proceedings. AGENCY may be represented at its expense by counsel of its choice in any suit.
35	In the case of a dispute regarding duties of confidentiality under this Agreement, arbitration shall not be the exclusive means of dispute resolution and a party may resort to judicial action in the courts of [location of the TRANSFEROR]
42	The International Chamber of Commerce shall have exclusive jurisdiction in judicial matters and the English version (of the contract) shall prevail.
46	Both Parties agree not to commence any legal proceedings in respect of any dispute arising under this Deed, which cannot be resolved by informal discussion, until the procedure provided by this clause has been utilized.

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Table 3.2.10.1 Levels of dispute resolution (continued)

Contract No.	Levels of dispute resolution
46 cont.	The restriction on formal legal proceedings shall not apply to the following circumstances: (a) either Party commences legal proceedings for urgent interlocutory relief; (b) the Instrument is terminated due to the default of one party; or (c) the GOVERNMENT or some government branch or agency commences action after investigating a suspected violation of law by the ACCESS PARTY.
	Despite the existence of a dispute, both Parties must (unless requested in writing by the other Party not to do so) continue to perform their respective obligations in accordance with this Deed.

In this connection, it is critical to note again the points made in Chapter 1, regarding the current level of uncertainty of ABS issues in law, which may make it difficult or impossible for judges and arbitrators in most countries to apply formal dispute resolution mechanisms (arbitration, mediation and judicial action).

3.2.10.2 Liability discussion

Finally, a number of contracts include provisions relating to the parties liability to one another or to third parties. Table 3.2.10.1 presents a variety of such provisions, including those that address (i) direct liability protection (including insurance and escrow arrangements); (ii) warrantees; (iii) indemnifications; (iv) releases, waivers and disclaimers. In addition, it includes provisions that clarify specific remedies, liability issues, and the duty to take action against third parties whose actions endanger rights or returns under the contract.

Table 3.2.10.2 Liability-related provisions

Contract No.	Liability and other legal protection and remedies
Insurance, Escrow and Direct Liability Protection	
4	The LICENSEE shall ensure that a minimum, it maintains in force, throughout the duration of the licence, commercial general liability insurance for a limit of liability not less than $1,000,000 per accident, loss or occurrence.
	Subject to paragraph 15 (Indemnification) in the event of any threatened or actual suit against the LICENSEE inconsequences of the exercise of the right and license granted herein, the LICENSEE shall promptly inform LICENSOR and the PARTIES will jointly decide on the steps to be taken in the circumstances. It is understood and agreed that, with regard to the threatened litigation or litigation arising from the license granted herein, or infringement of the LICENSED rights by others, the PARTIES will at all times consult each other and give to one another free of charge information or advice that may be helpful for such purpose. However, neither PARTY shall bind or commit the other PARTY to any course of action that involves liability for legal costs, expenses or damages. Nonetheless, should the PARTIES fail to agree, within a reasonable time, as to any course of action jointly to be taken, either PARTY shall be at liberty to take or defend any proceedings alone at its own expense and shall be entitled to retain anything awarded to it by a court in excess of royalties owed.
26	LICENSEE agrees to maintain a liability insurance program consistent with sound business practice
Warrantee	
7	Each of the parties warrants to the other that, to the best of its knowledge and belief (having made reasonable enquiry of those of its employees involved in the Project or likely to have relevant knowledge[, and in the case of the UNIVERSITY, any student involved in the Project], but not having made any search of any public register), any advice or information given by it or any of its employees[or students] who work on the Project, or the content or use of any Results, Background or materials, works or information provided in connection with the Project, will not constitute or result in any infringement of third-party rights.
	[alternative approach] Neither of the parties makes any representation or gives any warranty to the other that any advice or information given by it or any of its employees[or students] who work on the Project, or the content or use of any Results, Background or materials, works or information provided in connection with the Project, will not constitute or result in any infringement of third-party rights.
30	The RECIPIENT warrants that the Approved Research is non-commercial and that the RECIPIENT, and to the best of the RECIPIENT's knowledge no associated entity of the RECIPIENT, or any entity that carries on or proposes to carry on any business with RECIPIENT, holds any option, licence or other rights to the use or commercialisation of the Materials or the Results, or Intellectual Property arising from the Approved Research
	PROVIDER gives no warranty that any use of the Materials will not infringe the Intellectual Property rights or other rights of any third party

Table 3.2.10.2 Liability-related provisions (continued)

Contract No.	Liability and other legal protection and remedies
SMTA	The PROVIDER makes no warranties as to the safety of or title to the Material, nor as to the accuracy or correctness of any passport or other data provided with the Material. Neither does it make any warranties as to the quality, viability, or purity (genetic or mechanical) of the Material being furnished. The phytosanitary condition of the Material is warranted only as described in any attached phytosanitary certificate. The RECIPIENT assumes full responsibility for complying with the recipient nation's quarantine and biosafety regulations and rules as to import or release of genetic material.
39	Each Party to this Agreement represents and warrants to all other parties that it does not own or control any patent rights in any country that relate to the manufacture, use or sale of the Samples being provided to COMPANY under this Agreement.
40	Each member collecting or transferring Natural Materials under this Agreement warrants to the other members that it has obtained all relevant permits, licenses and other approvals necessary under national law for the collection, transfer, testing, use, export and environmental compliance, in the course of obtaining and using such materials.
Indemnification	
4	The LICENSEE shall indemnify and save harmless LICENSOR, its employees and agents from and against all claims, demands, losses, damages, costs (including solicitor and clients costs), actions, suits or other proceedings, all in any manner based upon, arising out of, related to, occasioned by or attributable to, any acts or conduct of the LICENSEE, its employees or agents, (whether by reason of negligence or otherwise) in the performance by the LICENSEE of the provisions of the LICENSE AGREEMENT or any activity undertaken or purported to be undertaken under the authority or pursuant to the terms of this AGREEMENT. The LICENSEE shall not be liable for the negligence of LICENSOR, its employees or agents. Notwithstanding any other provision in this License Agreement, the LICENSEE shall further indemnify and save harmless LICENSOR her employees, agents, servants and officers from and against all demands, losses, damages (including economic loss) costs (including solicitor/own client costs) actions, suits or other proceedings, all in any manner, based upon, arising out of, related to or occasioned by or attributable to the production, marketing, sale and use of the YYY or any variety created under this License Agreement, by any party.
7	The SPONSOR will indemnify the UNIVERSITY, the Principal Investigator and every [other] employee[and student] of the UNIVERSITY (the Indemnified Parties), and keep them fully and effectively indemnified, against each and every claim made against any of the Indemnified Parties as a result of the SPONSOR's use of any of the Results or any materials, works or information received from them pursuant to the terms of this Agreement, provided that the Indemnified Party must: (i) promptly notify the [Research Sponsor] of details of the claim; (ii) not make any admission in relation to the claim; (iii) allow the SPONSOR to have the conduct of the defence or settlement of the claim; and (iv) give the SPONSOR all reasonable assistance (at the SPONSOR's expense) in dealing with the claim. The indemnity in this clause will not apply to the extent that the claim arises as a result of the Indemnified Party's negligence, breach of clause 6 or the deliberate breach of this Agreement.
26	LICENSEE shall indemnify and hold AGENCY, its employees, students, fellows, agents, and consultants harmless from and against all liability, demands, damages, expenses, and losses, including but not limited to death, personal injury, illness, or property damage in connection with or arising out of: a) the use by or on behalf of LICENSEE its SUBLCENSEES directors, employees, or third parties of any Licensed Patent Rights; or b) the design, manufacture, distribution, or use of any Licensed Products, Licensed Processes or materials by LICENSEE or other products or processes developed in connection with or arising out of the Licensed Patent Rights.
30	The RECIPIENT releases and indemnifies PROVIDER, its officers and employees from and against any loss or liability arising out of or relating to the taking, possession, use, storage or transport of the Materials, however that loss or liability may arise. For the avoidance of doubt, the fact that PROVIDER has reviewed a description of the Approved Research does not constitute any advice by PROVIDER, nor any endorsement of the Approved Research
	The RECIPIENT indemnifies PROVIDER and its representatives and agents against all loss, liability, damage (whether to persons or property), costs and expenses (including without limitation legal expenses) claims, demands, suits and other actions arising out of the RECIPIENT's taking, use and disposal of the Materials and publication or disclosure of the genomic sequence data, including a limited and reasonable description, of the Materials
39	PROVIDER will protect COMPANY against any claims made by subcontractors acting under contract with PROVIDER for compensation or other payment for their services. Each such subcontractor shall execute an agreement with PROVIDER to acknowledge that it shall look only to PROVIDER for any compensation for services provided.
	PROVIDER shall indemnify and hold COMPANY, FOUNDATION and UNIVERSITY harmless from any suits, claims, demands, judgements, liabilities, costs, charges or expenses (including reasonable attorney's fees) or settlements thereof, which arise from the negligence or wilful misconduct (by act or omission) on the part of PROVIDER or its subcontractors prior to shipment of samples to COMPANY.

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Table 3.2.10.2 Liability-related provisions (continued)

Contract No.	Liability and other legal protection and remedies
39 cont.	COMPANY shall indemnify and hold PROVIDER, FOUNDATION and UNIVERSITY harmless from any suits claims, demands, judgements, liabilities, costs, charges or expenses (including reasonable attorney's fees) or settlements thereof, which arise from, out of or in connection with COMPANY's or any of its affiliates', licensees' or sublicensees' use of or access to any Sample or the development, manufacture use or sale of any Covered product, except those that result from the negligence or wilful misconduct (by act or omission) on the part of PROVIDER or its subcontractors prior to shipment of samples to COMPANY.
40	No party shall be responsible for the damage to any property provided to, or acquired by, any other party pursuant to this agreement.
46	The ACCESS PARTY shall indemnify (and keep indemnified) the ACCESS PROVIDER against any loss or liability incurred by the ACCESS PROVIDER, loss of or damage to the ACCESS PROVIDER's property; or loss or expense incurred by the ACCESS PROVIDER in dealing with any claim against the ACCESS PROVIDER, including legal costs and expenses on a solicitor/own client basis and the cost of time spent, resources used, or disbursements paid by the ACCESS PROVIDER; where such losses damage and expense arise from any breach by the ACCESS PARTY of its obligations under this Instrument, or any act or omission by the ACCESS PARTY in connection with this Instrument, where there was fault on the part of the person whose conduct gave rise to that liability, loss, damage, or expense.
	The ACCESS PARTY's liability to indemnify the ACCESS PROVIDER under this clause will be reduced proportionally to the extent that any fault on the ACCESS PROVIDER's part contributed to the relevant loss, damage, expense, or liability.
	The ACCESS PROVIDER's right to be indemnified under this clause is in addition to, and not exclusive of, any other right, power, or remedy provided by law, but the ACCESS PROVIDER is not entitled to be compensated in excess of the amount of the relevant liability, damage, loss, or expense.
	For as long as any obligations remain in connection with this Instrument, the ACCESS PARTY must have valid insurance as specified in [addendum to the form], and must provide satisfactory evidence of such coverage upon request from the ACCESS PROVIDER
Releases, Waivers and Disclaimer	
4	The LICENSEE releases COUNTRY and waives any cause of action the LICENSEE might have against COUNTRY, her employees, agents, servants, and officers arising from the production, marketing, sale and use of the YYY or the resulting product, the VARIETY by the LICENSEE or any third party.
7	Except under the limited warranty in clause [if that alternative is chosen) and the indemnity in clause, neither party accepts any responsibility for any use which may be made by the other party of any research information or other results, nor for any reliance which may be placed by that other party on such results, nor for advice or information given in connection with any such results.
Remedies	
7	The liability of either party to the other for any breach of this Agreement, any negligence or arising in any other way out of the subject matter of this Agreement, the Project and the Results, will not extend to any indirect damages or losses, or any loss of profits, loss of revenue, loss of data, loss of contracts or opportunity, whether direct or indirect, even if the party bringing the claim has advised the other of the possibility of those losses, or if they were within the other party's contemplation.
Liability	
7	The aggregate liability of each party to the other for all and any breaches of this Agreement, any negligence or arising in any other way out of the subject matter of this Agreement, the Project and the Results, will not exceed in total [the Financial Contribution]. Except that nothing in this Agreement limits or excludes either party's liability for: (i) death or personal injury; (ii) any fraud or for any sort of liability that, by law, cannot be limited or excluded; or (iii) any loss or damage caused by a deliberate breach of this Agreement or a breach of its provisions regarding confidentiality.
	Duty to take action
40	The INSTITUTE and those who share in any license in any IPR of the SPONSORING PROJECT shall use all reasonable measures whether by action, suit proceeding or otherwise against any person or entity infringing the patent, trade secret or other right, as necessary to present such infringement and/or to recover damages. All Costs and expense of any such action, suit or proceeding shall be borne by those who share the license of the IPR in question.

The liability-related provisions in Table 3.2.10.2, although extremely common in most commercial contracts, are completely absent from more than 70% of the contracts reviewed for this book. This finding may arise from the uncertainty of current national and international law regarding ABS and the rights of holders of genetic resources.

The Bonn Guidelines contain relatively few discussions of liability issues, however Article 61's provision regarding Remedies appear to be very important:

Parties may take appropriate effective and proportionate measures for violations of national legislative, administrative or policy measures implementing the access and benefit-sharing provisions of the Convention on Biological Diversity, including requirements related to prior informed consent and mutually agreed terms.

In addition, Appendix 1 to the Guidelines, at C.7, recommends that contracts contain 'dispute settlement arrangements,' and, at C.5, advocates the adoption of 'independent enforceability of individual clauses'.

3.3 Aligning 'contractual risk' with 'actual risk'

Once the various provisions above (and others) have been selected, the ABS contract process has only begun. Each party or negotiator must then consider the document as a whole, and evaluate both parties' status, duties and rights overall. At this point the primary role of contracts (in all commercial law) is to address 'risk' – the known and unknown costs and potential impacts of the transaction on the parties. All contracts involve risks, and not all risks can be prevented or even assessed.

Contracts are only one part of the risk matrix – other parts include safety and health protections, legal filings, confirmation of facts, and development of other formal and informal relationships among the parties. Within this matrix, the contract serves two purposes. First, it ensures that the parties have the same ideas and expectations regarding what will happen under the contract (this element is directed toward the risk of misunderstanding and the related possibility of law suits and other conflicts between them.) The second and more challenging task is to align the actual risk of the contract with the contractual/legal risks, to maximize the value of contract law in protecting against the actual risks of the contract. In other words, the contract must be designed to ensure that there will be a legal avenue for addressing the actual risks of the transaction. For example, consider the risk that the parties will not meet their payment obligations. It is addressed by contract provision that requires payment in exchange for samples. By formally memorializing this obligation, the contract maximizes the ability of the sample collector to use legal avenues to obtain payment. The sample collector will not have to take the law into his own hands and directly take the money from the payer's hands.

Normally, a contract lists the required performances of both parties in detail. This formally agreed listing enhances the ability of the law to determine whether a violation has occurred, in case one of the parties does not perform, and to determine how to redress that violation. Legal redress in these cases will usually be either invalidation of the contract (forcing the parties to unwind their agreement, and give back property or money already received) or equitable reimbursement (the violator must make civil payment to reimburse the injured party for losses and costs incurred.) (Contract law has developed a full 'toolbox' of various remedies and other methods of redress, based on these two ideas.[52]) These provisions often work indirectly – parties comply in part because the contractual system serves them best if they comply. Only rarely is it necessary to take the dispute to court, because the contractual remedy system for addressing risk parallels the actual risks that exist in conventional contracts – that is, the party who affects and is affected by the risk is the same as the party who has the contractual obligation to address it.

In ABS contracts, there are some risks which are not parallel to the existing contractual risk-protection system. The two most important of these relate to contractual redress. In many cases, contractual invalidation will not be effective as a means of balancing risks. Where a user has already obtained samples, genetic information or other reproducible resources, it may be difficult for the law to unwind that contract in future. Even if the material and information is returned, the provider can have no immediate way of ensuring that the user has not kept copies or progeny of the original genetic resources. It may be technically possible for a provider with sufficient resources to inspect the user's operations, or to determine what genetic resources were used in the development of a particular product.[53] Most providers, however, do not have the resources and technical capacity to do this. Normally, however, national contract law

52 CBD Secretariat, 2007a.

53 The author is not certain that external testing can fully determine this for legal purposes.

is driven by private action. A required basis for bringing the legal action is that a plaintiff must obtain sufficient evidence of a type to satisfy a court. The government will normally not take action to develop this evidence. The cost of preparing a legal action, particularly regarding technical contracts, must be paid by the person bringing the action. That cost is often enormous.

As a result, it is important for the parties to ABS contract to carefully examine each provision of the contract, asking what risks it is intended to address, how it protects against that risk, and what will happen if that risk arises. For example, as discussed in 3.2.1, above, one way of protecting against risk is to ensure that the signatories are authorized to enter into the contract and are able to perform all duties stated in the contract. The contract can do this in two ways. First, it obtains statements from the parties, guaranteeing that they are authorized and capable. Second, it will sometimes require the parties to provide official proof of these matters. In normal contracts, the first approach may be sufficient. If the party's statements and guarantees are incorrect, then the contract will simply be invalidated and unwound. In ABS, however, it may not be possible to unwind the contract. If either party's assurance of authority is incorrect, then there may be no effective legal redress. If the user's assurance is incorrect, the provider has effectively given away the genetic resources to a stranger. If the provider's assurance is incorrect, the user may have paid money for property that it will have to buy again from another party. Hence, it is normally essential to use other measures to validate the *bona-fides* of the parties in an ABS contract.

Many ABS contracts are circumscribed by law – valid only if the parties have complied with this law and are authorized to grant access to or use genetic resources. The CBD specifically recognizes that genetic resources are governed by national sovereign rights. These rights exist regardless of whether the country has adopted any specific law on this issue. At present, only about 10% of the countries on the planet have adopted such laws. This means that all of those other countries are uncertain legally. Hence, one of the most important questions in ABS contracts is 'What national law applies?' This question is answered in some contracts by apportioning the risk of violation of law. One party or signatory may be formally required to certify that the law has been complied with, and that he has obtained all necessary permits or to address any violations of national ABS law.

The problem with this approach is that it assigns the legal risk without assigning the actual risk. If the contract says that the provider has authority or that he will obtain the necessary permits, this means that the user can bring suit against that provider, in the event of a violation. In bringing that lawsuit, however, the user will not gain a valid right to the genetic resources or other rights transferred by the contract. No matter what the user has paid to the unauthorized person, he has not obtained any rights against the true owner of the resources. To gain the rights to the resources, he will have to renegotiate a new contract with the true authorized provider, and pay again.

Normally, the actual risks to providers in ABS transactions have not been addressed by lengthy and detailed ABS legislative and administrative requirements. In some cases, national requirements achieve other critical objectives (e.g., public participation), but they have rarely improved the countries' commercial risk situation under the ABS contracts and licenses that they issue.

3.4 A few final observations

The law is an evolving process. National legislation arises out of need. Until the time that national legislation answers key questions, contracts operate as a form of 'private legislation, enabling parties to go forward only after their particular concerns, issues and fears have been addressed by a binding agreement among the parties. The strength of contracts to fill this role relies on some legal factors that must be understood or presumed, such as the ownership of the subject matter and the extent of any person's rights to take actions that affect other persons in a given sector.

In 1992, many observers and participants assumed that the ambiguities of the ABS provisions of the CBD would be resolved in the same way that the ambiguities in the Convention on Trade in Endangered Species of Fauna and Flora (CITES) had been answered 19 years earlier. That is, they assumed that each country, espe-

cially the developed countries with greatest experience in crafting new and complex legal structures,[54] would immediately begin to investigate pathways to implementation of Article 15. Once the primary countries had found systems for addressing their needs as both providers and users – and addressed the complex question of how rights in genetic resources could be identified and protected across national boundaries, it was expected that other countries would be able to develop their own laws which integrated with these pioneer laws, eventually weaving into an agreed international regime. Contracts for ABS were expected to play a detailed part in this process.

Over the ensuing 17 years, these initial expectations have not been met. Only a few countries have adopted ABS legislation and that legislation has not addressed the countries' responsibilities as potential users of genetic resources. Without the leadership of the major user-side countries, and other regulatory-system developers, the ABS system remains one-sided and ineffective. Contracts, rather than filling their primary role of helping to evolve the *details* of the ABS system have been forced to try to fill the gaps in *primary legislation*, including even key issues such as resource ownership, the nature of access, and the meaning of benefit-sharing.

Until the international regime negotiations are able to answer the primary questions of ABS, it appears that contracts will have to continue to try to fill this gap, to the extent that they can. The contracts examined for this Part have done this in a variety of ways, using everything from the simplest provisions to the most complex. To date, however, the legal impact of these contracts remains untested, and the legal effectiveness of many critical innovations remain unproven.

Within this uncertainty, the work of the ITPGRFA in adopting and implementing the SMTA is of great interest. It has provided a governmentally agreed instrument which uses, to the greatest extent possible, existing concepts, including the 'material transfer' approach (viewing the term 'genetic resources' to refer to physical samples), the adoption and expansion of principles for streamlined contractual formalities (shrink-wrap and click-wrap) and most important, the recognition that a legal system in which 'standard practice' grows out of multiple use and experience will ultimately be as strong as any statutorily crafted system.

This suggests a great value in maximizing the transparency of ABS contracts and promoting their public availability. The development of contract law has taken many hundreds of years. It is possible that the process would have been swifter if more contracts had been available to officials making key decisions. In practice, however, judges, regulators and legislators had official access only to contracts that had entered the public domain, in whole or in part, through lawsuits. In order to short-cut this development process for ABS, countries will need to increase their level of awareness of the precise terms and operations of a large variety of actual ABS contracts. As demonstrated by this book, only a small percentage of ABS-related contracts are available for examination.

The precise boundaries between the ITPGRFA/SMTA and the other sectors of ABS are still not clarified. Over time, the SMTA example may be followed by other sectors, with regard to particular users, types of uses and materials outside of the ITPGRFA's multilateral system. This is not likely in all sectors however. Each sector's own experience should be the primary means by which ABS contracts become understood, interpreted and/or enforced. Hence, the creation of a large and transparent body of contractual experience may be the most important determinant of the legal rules governing both users and providers. Accordingly, the current book's first effort to provide a review of ABS contracts that are publicly available may presage the informal development process by which public contracts become the primary template for all ABS. It may be advantageous to all ABS Parties and stakeholders to ensure that their contracts, forms and models become generally known and available.

54 For example, it was through the action of developed countries that complex functional legal regimes for intellectual property, antitrust, security interests in property and bankruptcy have become common systems.

Glossary for Part I

In addition to seeking to be precise about our use of terms that are sometime used imprecisely in ABS discussion, the authors in this part have sometimes found it necessary to focus specifically on particular types of parties and intergovernmental relationships (i.e., relationships between user country and provider country.) The following glossary reflects some of our most common usages[1].

TERMS DESCRIBING THE ROLES OF VARIOUS *PARTIES* TO THE ABS CONTRACT:

USER

Any person (individual, company, university, agency, national government or other entity) that is either:

- 'utilising genetic resources;'
- acquiring genetic resources with the intention to utilise them; or
- generating benefits from that utilization (as eventually defined under the international regime), where the genetic resources come from another country.

PROVIDER

One who provides genetic resources to the user. The exact nature of the provider depends on national law, it can mean**:**

- any individual which can legally collect/sell/give anyone biological material including its genetic resources, *where national law gives that power to individuals based on property ownership or other factors*; or
- some other person, entity or agency which has a specific legal right under national law to grant 'genetic resources' (usually the government.) This person's rights to act as 'provider,' will normally not affect the separate power of an individual owner who must be paid for the biological material. This separate power does not, however, enable that owner to grant rights in the genetic resources, in these cases.

MIDDLEMAN

Any person or entity (collector, user or other) who is not a 'provider' or 'source country', but who has obtained and is passing on genetic resources to another person or entity (user or another middleman). A user who sells or otherwise transfers his materials and/or results to another user may also be a middleman. It is not clear whether middlemen should be considered to be 'users' or 'providers.' Some middlemen generate (monetary or non-monetary) benefits, not currently captured by the ABS system.

1 This 'taxonomy' of ABS participants is based on tables contained in Book 2 of this series (Tvedt and Young 2007). This is partly for consistency and partly because one of the authors of this book is very pleased with her work on the prior publication.

TERMS DESCRIBING THE VARIOUS *COUNTRIES, GOVERNMENTS AND AGENCIES* INVOLVED IN ABS CONTRACTS AND THEIR IMPLEMENTATION:

USER COUNTRY

For any particular ABS transaction, the country in which the user is based, undertakes its primary utilisation of genetic resources, whether such jurisdiction is due to nationality or because the user is utilising the genetic resources within that country's jurisdiction. In an ABS transaction there may be more than one user country.

SOURCE COUNTRY

For each particular ABS transaction, the country from which genetic resources originally were take, which have made their way to a user from a different country for purposes of 'utilisation of genetic resources' (as that term will be understood under the international regime). Any country may be a source country as to wild resources found in situ within the country or agricultural varieties developed there. (In theory at least, the determination of which country or countries particular resources originated in is a simple question of fact. Even if the original specimens have since died or disappeared, their progeny derive from one or more original sources. In practice, however, the tracing of the specific ancestry of particular plants, animals and micro-organisms is not a simple task, and may not be possible at all.) Unless it has transferred those genetic resources to another country 'in accordance with the Convention' (see Article 15.3), the 'source country' will be the 'country providing resources' under the CBD. (Note: Because the term 'provider country' is used by various users with completely different meanings, it will not be used in this book.)

COUNTRY OF ORIGIN

Any country in which the specific genetic resources in question can be found in *in situ* conditions.[2] It is frequently noted that many species are found *in situ* in more than one country, but only one of these countries will be the source country. This concept can be important where a user does not know or will not disclose the specific country that is the source of genetic material he is using. The CBD appears to assume one of the 'countries of origin' will be the 'country providing resources' in most cases.

SECONDARY SOURCE

A country that has acquired the genetic resources from a 'country of origin' of the particular species, subspecies or variety in accordance with the CBD (Article 15.3.) A secondary source country meets the definition of 'country providing resources' under Article 15.3, and can engage in ABS transactions (including benefit sharing if it chooses) as to that species.

INTERMEDIATE COUNTRY

(in some legislation, called the 'provider country') Any country to which genetic resources are taken after they leave the source country, from which the resources are later transferred to a user, collection or other person or entity. Normally, this will be the country with jurisdiction over a user or middleman, where that user or middleman is transferring the genetic resources that were previously removed from the source country (a different country). It should be noted that benefit-sharing with a provider is required under ABS only where that source country is either (i) a country of origin, or (ii) a secondary source.

2 The CBD defines ‚*in-situ* conditions' to mean ‚means conditions where genetic resources exist within ecosystems and natural habitats, and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.' CBD Art. 2.

TERMS DESCRIBING *RELEVANT LEGISLATION* APPLICABLE TO ABS CONTRACTS:

PROVIDER-SIDE LEGISLATION

National law of a country which addresses the access to and utilisation of that country's genetic resources. The CBD does not directly require such legislation, however, the Bonn Guidelines note that it is much easier for users to obtain access to these resources where a country has clarified its existing laws and practices.

USER-SIDE LEGISLATION (or 'USER MEASURES')

The legal, regulatory or other measures adopted by a country to require uers of genetic resources within that country to engage in benefit-sharing with other countries that are the source country of the genetic resources. Technically, under the CBD, laws relating to transfer of GR and other actions by middlemen would be considered 'user-side legislation.' (This term does not include measures of a country to require benefit-sharing with the legislating country.) User-side legislation is specifically required ('shall adopt') of all CBD parties, regardless of whether they are developed or not.

CONTRACT AND COMMERCIAL LAW

Legislation, caselaw and recognised practises governing the execution, implementa tion and enforcement of contracts (including specific legislation covering particular types of contractual and commercial relationships), insurance and surety, and other commercial issues, as well as law and practice designed to

- prevent abuses;
- protect consumers and the weaker party in the contract;
- recognise the rights of third parties; and
- recognise the government's responsibility to ensure fairness and balance in the commercial sector.

PROPERTY AND OWNERSHIP LAW

All national law governing the rights and responsibilities of holders, purchasers and other users or all types of property, including land/real-property, mobile/personal-property, intellectual/industrial property, other intangible property. In addition, this term includes property law and ownership issues where the property has special public status, as national patrimony, government land, un-owned (claimable) land, etc.

SOVEREIGN RIGHTS AND INTERESTS

Although no legislation is required to create or exercise a sovereign right, many countries have adopted laws to determine the responsibilities of national officials and agencies in applying or protecting the country's sovereign rights. Most of this law is generic (i.e., not separately addressing each specific sovereign right or patrimony.) Such law is found in different forms in each country. Often it is part of the national constitution and other law empowering and mandating the roles of government; however it may also appear in substantive and sectoral legislation, particularly where these duties are assigned to regional or sectoral agencies.

OTHER LEGAL TERMS USED IN THIS PART

Although we have tried to avoid using 'legalese' there are some legal terms which have helped us avoid long repetition. We have tried to keep these to a minimum. We note that these terms are probably not common to all legal systems, so we define them here.

'ABS CONTRACT' — In this book, the generic term 'ABS Contracts' refers to the overall group of possible instruments, including any agreement, license, permit, document or other arrangement, under which the user or his predecessor in interest acquires permission from the source country to gain access to, bioprospect for, utilise genetic resources and/or to share benefits arising from that utilisation, in exchange for other commitments. In some cases, a contract is believed by one or all of its parties to be an 'ABS contract' despite the fact that it does not use the term 'genetic resources' or refer to the concept.

ORGANIC LAW — The term 'organic law, is a generic term to describe the basic instruments which determine how a country functions legally. These matters vary widely among countries and are generally unchangeable for ABS purposes – it is unlikely that a country will change its entire organic law to accommodate a few foreign parties to contracts. For many countries, the primary organic law is a national constitution or charter. In ad dition, other organic laws describe the authority of courts and enforcement officials, set the procedures for administrative action and licensing, and determine many other factors regarding the manner in which the various components of the central govern ment and their ministries are organised, governed, financed and overseen. In federated countries, there is often an additional layer of organic law relevant to the provincial, state or other sub-national level.

RES — In law, this latin term refers to the main subject matter of a contract. This term is useful because it includes all types of contractual subject matter, i.e., different kinds of property (land, moveable property, intellectual/industrial property, intangible property), legal rights which one party has a power to grant or sell to another, services or other actions, mutual promises, etc. At present, it is not entirely clear what 'genetic resources' are – whether they are kind of property, a legal right or other some other interest. Consequently, we use the term *res* rather often in Part I.

SPECIES — Normally, the term 'species' is one of a suite of taxonomic terms describing particular levels of the relationship between each life form and other life forms. In ABS discus sions, as in many international policy discussions on conservation instruments, it is common to use the term 'species' to mean any or all of the following: species, subspecies, variety or geographically separate population.

'SUCCESSOR IN INTEREST' — is used to mean any person, entity or country who obtains a right or property from another person, whether by purchase, inheritance, gift, legal succession, confiscation, by operation of other granting language in a law or contract, or any other legally recognised transfer.

The authors have made no attempt to resolve the more basic and difficult terminology problems, including the ambiguity regarding the meanings of the terms 'genetic resource,' 'utilisation of genetic resource,' 'derivative,' 'benefit-sharing' and 'access.' In addition, although terms such as 'IPR,' '*sui generis* system,' 'sovereignty,' 'sovereign rights,' 'property,' 'patrimony,' 'sovereign property,' 'government (or 'crown') property,' already have well established legal

meanings, they are either (i) subject to enormous variation among countries, or (ii) not consistently used or understood among CBD negotiators, focal points and implementing agencies.

Finally, a range of terms, especially 'bioprospecting' and 'biopiracy,' have become a form of CBD slang, used generally in discussions, but with fuzzy meanings which vary with the speaker. Occasionally, a countries may adopt one of these terms in its national law, giving that word a precise meanings for purposes of applying the laws of that country (only). This practice is very useful legally. It does not, however, impact the international usages of these terms, whether formal (which are few or none) or slang (which continue to multiply).

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Part II

4 Science, Technology, and the Renaissance of Bioprospecting: A Comparative Analysis

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Since the Convention on Biological Diversity came into force in 1993, access and benefit-sharing (ABS) agreements have been used to facilitate the implementation of bioprospecting projects. While many of these agreements have been negotiated and signed among private and government parties in countries that lack national ABS policies, there are also cases where they have been established under these policies and with the involvement of government agencies that usually enforce a lengthy and slow application process. Empirical evidence shows that national ABS policies have thwarted or delayed access to genetic resources in a few countries (*see* Brush and Carrizosa 2004 for some examples). Because of reduced access, many companies increased their reliance on existing collections of organisms[2] and the potential of modern biotechnology techniques to develop drugs from scratch. This, in turn, discouraged some pharmaceutical, agricultural, and biotech organizations from collecting genetic resources in biodiversity-rich countries. This situation was particularly evident during the 1990s (ten Kate and Laird 1999).

Over the last seven years, several commentators have underscored the fact that despite its decade-long commercial development, combinatorial chemistry[3] has failed to put in the market novel drug candidates for the treatment of common diseases, including cancer. Consequently, companies are looking for unexplored groups of organisms such as extremophiles, endophytes, marine organisms, and microorganisms as sources for novel genes and molecular structures. The interest of the industry for these species has also been encouraged by streamlined ABS policies from countries such as Costa Rica, Australia, Samoa, and Thailand (Carrizosa 2004), the increasing possibility to negotiate ABS agreements in countries that lack national ABS policies (Brush and Carrizosa 2004), and recent research that continues to demonstrate the importance of natural products[4] for the pharmaceutical industry[5] (Newman *et al.* 2003). These are clear indicators of a renaissance in interest by pharmaceutical and biotech companies in an old-fashioned bioprospecting approach in regions where ABS regulations are permissible and clear. This renaissance is strengthened by scientific advances in the identification of molecular targets for diseases, modern screening techniques, gene technology, large scale culturing of microorganisms, chemical purification techniques, and structure elucidation of natural compounds.

Some pharmaceutical and biotech companies (e.g., those involved in the International Cooperative Biodiversity Group Program) that are going back to the bioprospecting field are aware of potential benefit-sharing obligations and are prepared to share monetary and non-monetary benefits derived from bioprospecting ventures. Most of these companies may not be willing to sign ABS agreements that include significant up-front payments such as the famous Costa Rican National Institute of Biodiversity (INBio)-Merck agreement. But they are certainly disposed to provide a share of the royalties, milestone payments, and short-term compensation packages that include training and transfer of technology. They

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2 Today, most *ex-situ* collections have benefit-sharing obligations with the countries that provided their biological resources and these obligations usually extend to all users of these resources (Carrizosa 2004).

3 Combinatorial chemistry was born in the 1980s when Mario Geysen invented the pin method in which simultaneous synthesis of diversified peptides gave rise to the first combinatorial libraries.

4 Natural products are defined as chemical compounds derived from biological sources.

5 A review of the origin of drugs over a 22-year period (1981-2002) indicated that 60 and 75% of drugs in the areas of cancer and infectious diseases, respectively, are of natural origin (Newman *et al.* 2003).

are also looking for counterparts that have realistic expectations for benefit sharing and can add value to the resources collected. This paradigm is reflected in the ABS agreements signed by INBio (*see* Costa Rican Chapter No. 5, this volume) and in the 2005 Novartis- The National Center for Genetic Engineering and Biotechnology (BIOTEC) three-year agreement aimed at developing new drugs based on genetic resources found in Thailand. In June 2006, Novartis, encouraged by early positive results, renewed the agreement with BIOTEC until May 2001 (BIOTEC Press Release, July 16 2008).[6] Another example of this trend was the 2002 collaborative research and benefit-sharing agreement signed between the Japanese pharmaceutical company Nimura Genetic Solutions (NGS) and the Forest Research Institute Malaysia (FRIM) for the collection of soil microorganisms. In late 2002, this relationship was strengthened through the establishment of a subsidiary of NGS under the auspices of FRIM (GRAIN, 2002).[7] Similarly, in the last eight years, AztraZeneca has invested about A$100 million in the development of a Natural Products Discover Unit in collaboration with Griffith University[8] in Australia. Substances discovered by this joint venture were the source of several patent applications in 2003. Furthermore, in March 2008, Griffith University reported that its partnership with AztraZeneca continues and scientists are currently targeting the development of two promising lead compounds identified from the high-throughput screening of an extensive collection of 45,000 plants and marine invertebrates and their extracts.[9]

Today, the number of small- and medium-sized biotech and pharmaceutical companies whose core business is the discovery of novel pharmaceutical lead compounds is also increasing and most of them are providing some of the big pharmaceutical and biotech companies with extracts of natural products. For example, the Australian-based company Cerylid Biosciences Ltd has a very extensive library that contains 750,000 extracts. About 80 to 90% of these samples have been collected in Australia and the rest comes from countries such as Malaysia (Sarawak) and Papua New Guinea. Cerylid is also an example of the many firms that have obtained biological samples through collectors such as the Royal Botanic Gardens and the Australian Institute of Marine Sciences. These and other collectors usually establish benefit-sharing agreements with the provider or owner of the resource and a local government agency that include short-term payments and the promise of royalties if products are developed and commercialized. These are examples of 'best practices'. Nevertheless, it is also important to keep in mind that there are also companies that take the opposite approach with activities that fall within the realm of biopiracy.

While some organizations have recently experienced a renaissance in their interest for genetic resources, others' interest has not flagged. Some have been committed to both the potential offered by these resources, and the ideals of benefit sharing with providers of these resources, for many years. Research organizations such as the United States National Cancer Institute (NCI), aware of the potential of natural products as source of treatments for cancer, have continuously and consistently commissioned botanical gardens and universities to collect biological samples of plants and terrestrial and marine microorganisms, from over 35 countries for the last 40 years (*see* NCI Chapter No. 6, this volume). About four years before the CBD was drafted the NCI pioneered the use of Letters of Collection (LOC) that proposed benefit-sharing terms in the event of the licensing and development of a promising drug candidate**.** So far 14 countries[10] have signed LOCs. Nevertheless, the NCI is committed to the terms of the LOC irrespective of whether or not

6 http://www.biotec.or.th/biotechnology-en/en/Newsdetail.asp?id=4195

7 http://www.grain.org/bio-ipr/?id=110

8 On 11 June 1993, a joint venture agreement was signed between Griffith University and Astra Pharmaceuticals Pty Ltd, Sydney, Australia, a subsidiary of Astra AB of Sweden. Astra AB merged with pharmaceutical giant Zeneca in 1999 to form AstraZeneca. This joint venture is today known as AstraZeneca R&D Griffith University.

9 http://www3.griffith.edu.au/03/ertiki/tiki-read_article.php?articleId=15841

10 Australia (Museum of the Northern Territories, 2002), Bangladesh (Bangladesh National Herbarium, Dhaka, 1994), Cambodia (Forest and Wildlife Research Institute, Department of Forestry and Wildlife, Phnom Penh, 2000), Ecuador (The AWA Peoples Federation, 1993), Gabon (Centre National de la Recherche Scientifique et Technologique, Libreville, 1993), Ghana (University of Ghana, Legon, 1993), Laos (Research Institute of Medicinal Plants, Ministry of Public Health, Vientiane, 1998), Madagascar (Centre National D'Applications des Recherches Pharmaceutiques, Antananarivo, 1990), Palau (Government of Palau, 2002), Papua New Guinea (University of Papua New Guinea, Port Moresby, 2001), Philippines (Philippines National Museum, Manila, 1992), Sarawak-Malaysia (State Government of Sarawak, State Department of Forests, 1994 and Sarawak Biodiversity Center, 2002), Tanzania (Traditional Medicine Research Institute, Muhumbili University College of Health Sciences, University of Dar Es Salaam, 1991), and Vietnam (Institute of Ecology and Biological Resources, National Center for Natural Science and Technology, Hanoi, 1997).

an official agreement has been signed (pers. comm. G. Cragg, 18 April 2005). Biological samples collected by the NCI are stored in its Natural Products Repository in Frederick, MD (USA). Pharmaceutical companies such as Aphios Corporation have signed Material Transfer Agreements with the NCI (in 2004) in order to access its natural products repository and they are required by the NCI to comply with the terms of LOCs if products are developed and marketed from the samples covered by these agreements.

The NCI efforts and the CBD mandate have inspired a major international bioprospecting effort called the International Cooperative Biodiversity Groups (ICBGs). Since 1993, the ICBGs have facilitated the participation of 14 major biotech and pharmaceutical companies[11] in bioprospecting projects carried out, currently being implemented, or in planning stages in over 20 countries.[12] These projects have delivered mixed results and accomplishments (Rosenthal 1999, Brush and Carrizosa 2004, Larson-Guerra *et al.* 2004, http://www.fic.nih.gov/programs/icbg.html). The Panamanian ICBG (*see* Chapter No. 7, this volume) describes the scientific implications of the contract negotiation of the ICBG in Panama, one of the most successful ever implemented.

Terrestrial organisms, particularly plants and microorganisms, have been the basis of early developed biotechnology products and continue to be the source of new products, albeit with declining rates of success. Terrestrial microorganisms, for example, have yielded over 120 of today's most important medicines, however, intensive studies of soil microorganisms repeatedly yield species which produce previously described compounds (Jensen and Fenical 2000). Consequently, many scientists have turned their attention to the potential offered by marine organisms and microorganisms, including the so-called extremophiles that are found in extreme habitats where most organisms are not able to survive. Furthermore, in the last few years, scientists have accumulated enough evidence to demonstrate that terrestrial and marine organisms that were thought to be the source of active compounds are just the hosts of microorganisms that are the true producers of these compounds (*see* NCI Chapter No. 6, this volume). This finding has interesting implications for the sustainable supply of compounds needed for clinical trials and the development of end products.

This chapter first provides an overview of the potential offered by marine organisms, extremophiles, and symbionts that are renewing the interest of bioprospecting efforts worldwide. Increasing scientific evidence reveals the role of symbionts as the real producers of natural products. This and other findings will have key implications for the development of ABS agreements. Following this review the impact of science and modern technologies on the discovery process of natural products is examined. Finally, the chapter concludes with an overview and analysis of selected scientific issues that are likely to influence the negotiation of ABS agreements in the future.

4.1 Marine organisms

Global estimates of marine diversity vary between 500,000 and 10 million species and with regards to drug discovery this diversity is just beginning to be examined. The oceans started to attract interest from the pharmaceutical industry only since the 1950s with the discovery of two sponge-derived nucleosides that years later served as a lead structure for the development of commercially important anti-viral drugs such as ara-A and the antileukemia drug ara-C (Proksch *et al.* 2002 and 2003). But the high rate of discovery of interesting compounds and potential products generated in the last two decades has been the result of complex technological advances in diving technology as well as in molecular biology. Such potential was acknowledged in the mid-nineties through a report from the Biotechnology Research Subcommittee (1995) of the National Science and Technology Council of the United States that underscored the importance of marine organisms as a source of new and improved products for the pharmaceutical, crop protection, and bioremediation industries, among others.

11 These companies include: American Cyanamid Company, Anti-Cancer Inc, Bristol Myers-Squibb Pharmaceutical Research Institute, Diversa Corporation, Dow Agrosciences, Glaxo Wellcome, Eisai Pharmaceutical Research, INDENA SpA, Molecular Nature Ltd, Novartis Oncology, Phenomenome Discoveries Inc, Phytomedics Inc, Searle-Monsanto, and Wyeth Pharmaceuticals.

12 Argentina, Cameroon, Chile, Costa Rica, Fiji, Jamaica, Jordan, Kyrgyzstan, Laos, Madagascar, Mexico, Nigeria, Panama, Papua New Guinea, Philippines, Peru, Samoa, Surinam, Uzbekistan, and Vietnam.

In recent years, thousands of active compounds have been extracted from marine organisms that include bryozoans, nudibranchs, sea hares, sponges, soft corals, and tunicates. In January 2006 Marinlit, a database of marine natural products literature, reported that about 15,100 compounds had been derived from 3,088 marine species. Three years later, the number of compounds registered by the database has increased to 22,000 compounds derived from 3,355 species (http://www.chem.canterbury.ac.nz/marinlit/marinlit.shtml). In spite of such increasing amazing diversity of compounds only a few approved pharmaceuticals derived from marine organisms (e.g., cytarabine and vidarabine) have reached the market (Kijjoa and Sawangwong 2004). Nevertheless, as Faulkner (2000) argues 'pharmacological research involving marine organisms is intrinsically slower and has disadvantages compared with a program based on synthesis, but the number and quality of the leads generated more than justify research on marine pharmacology.' A handful of such lead compounds have contributed to the development of over 15 marine products derived mostly from invertebrates (sponges, tunicates, mollusks, and bryozoans)[13] that are currently in clinical trials mostly in the areas of cancer, pain, and inflammatory disease (*see* Table 1, this chapter). In addition, since the identification of new compounds is progressing as suggested by the Marinlit database, the potential for new drugs is not only promising, but it is becoming a reality. Revolutionizing compounds like ziconotide (also known as Prialt®), isolated from the cone *Conus magus,* came out of the pipeline of clinical trials a couple of years ago. The European Union and the USA Food and Drug Administration approved ziconotide for the treatment of severe chronic pain in February 2005 and January 2004 respectively. This is the first compound in over 40 years that has been added to the repertoire of drugs for treating severe pain. Ziconotide is a thousand times more potent than morphine and it works by preventing neurotransmitter release at the synapse, thus blocking pain sensation (Garber 2005). On the other hand, most compounds do not get to market. For example, didemnin B, isolated from a tunicate found in the western Caribbean Sea, went through Phase II clinical trials but it was abandoned during human trials due to its high toxicity. Similarly, girolline and jaspamide, isolated from the Melanesian sponge *Pseudoaxyssa cantharella* and the Indo-Pacific sponge *Jaspis splendus*, respectively, were also withdrawn from clinical trials due to their extremely toxic side effects (Arif *et al.* 2004).

The wealth of bioactive metabolites isolated from marine invertebrates that usually lack morphological defenses is a clear indicator of the importance of these compounds for the survival of the species. It has been demonstrated that chemical defense is an effective strategy to fight off predators or to ward off other species competing for space or food (Proksch and Ebel 1998). Therefore, most drug candidates from the sea have been isolated from sessile invertebrates that inhabit coral reefs in tropical or subtropical waters where there is great competition for space and food and significant pressure from predators such as fishes. Deep-diving technologies and remote-operated machines have also opened the possibility to collect and examine the pharmacological potential of entremophiles or organisms that live in extreme environments, such as the deep-water sponge *Discodermia dissoluta.* This sponge is the source of discodermolide, a secondary metabolite, that has shown potent anti-tumor activity against human lung cancer cells and breast cancer cells and it is currently in clinical trials (*see* Table 1, this chapter) (Proksch and Ebel 1998). Scientists have found that cytotoxicity of marine organisms clearly surpasses those of terrestrial origin. Therefore, it is no surprise that marine natural products have found their stronghold in the area of anti-cancer chemotherapy (*see* Table 1, this chapter). Kosan Biosciences, PharmaMar, and Eisai Medical Research Inc., for example, have in preclinical and clinical trials several anti-cancer drug candidates from marine genetic resources (http://www.clinicaltrials.gov/ct/show/NCT00100932, http://www.pharmamar.com/es/pipeline/).

Marine organisms also have great potential as a source of compounds for other industries that include cosmetics, agribusiness, and orthopedics. Chitin and chitosan have been used in several areas of technology for many decades. Chitin, a polysaccharide, is abundantly available from the shells of arthropods such as shrimp and crab. Chitosan is a biopolymer derived from chitin. These two compounds have multiple applications in drug delivery, cosmetic formulation, surgical wound dressing, hypertension, textiles, and dietary supplements. The skeleton

13 In contrast, in the terrestrial environment, plants exceed animals with regard to the production of secondary metabolites (Proksch *et al.* 2003).

of individuals of the coral family Isididae has also being used as an orthopedic implant in bone grafting surgeries (Maxwell 2005). The pseudopterosins are a group of anti-inflammatory and analgesic compounds isolated from the Caribbean sea whip (*Pseudopterogorgia elizabethae*) that have cosmetic applications. The company Estée Lauder brought one of the pseudopterosins to market in record time as an additive in the cosmetic line Resilience. It should be noted that economic benefits have not been shared with the Bahamas which is the source country of samples of the Caribbean sea whip (NBSAP 1999, pers. comm. R. Newbold, 28 October 2005).

4.2 Symbionts: Are they the true sources of natural products?

Many eukaryotes[14] are themselves involved in a variety of intimate associations with other organisms ranging from symbiotic to pathogenic. In the last decade, scientists have accumulated significant evidence suggesting that bacterial symbionts are responsible for the production of a wide range of natural products isolated from eukaryotes such as plants (Piel 2004). There are many highly evolved groups of microorganisms, known as endophytic microorganisms, residing in the living tissues of plants. Endophytic microorganisms such as fungi and bacteria are found in every plant on earth (over 300,000 species of higher plants) and they produce a great variety of substances that ensure the protection and survival of the host plant. Only grass species (i.e., *Neotyphodium* sp.) have been extensively studied relative to their endophytic biology (Piel 2004). Isolation and culturing of individual endophytes have led to the identification of a great variety of substances that include antibiotics, antimycotics, antidiabetic, antioxidant, insecticidal, immunosuppressants, and anticancer compounds. Some of the most interesting compounds produced by endophytic microbes include cryptocin, cryptocandin A, jesterone, oocydin, isopest, acin, the pseudomycins, and ambuic acid (Strobel *et al.* 2004).

In addition, some plants that generate bioactive natural compounds have associated endophytes that generate the same product. This is the case of the fungus *Taxomycetes andreanae* that was isolated in 1993 from the yew tree *Taxus brevifolia*. Both the fungus and tree produce the famous anticancer agent taxol (Suffness 1995). This might be related to a genetic recombination of the endophyte with the host that occurred during the course of the evolution of these organisms. Therefore, if endophytes can produce the same compound as the host plant this has important implications that might facilitate the sustainable supply of this compound at industrial levels. It is recognized that a microbial source of a high value product may be easier and more economical to produce thereby reducing its market price. However, a great deal of uncertainty exists between what an endophyte can produce under *in vitro* conditions and what it may produce in nature. All aspects of the biology and relationship between endophytes and their hosts are a vastly unknown and under-investigated field (Strobel *et al.* 2004).

In the marine realm, invertebrates such as the sponge *Dysidea herbacea* contain bioactive compounds of great pharmaceutical interest that can also be found in associated organisms. The sponge tissue is loaded with *Oscillatoria spongeliae,* a cyanobacterial symbiont which comprises about 50% of the cellular volume of the sponge. Further analysis has shown that the same bioactive compound can be isolated from the symbionts (Bewley and Faulkner 1998). Circumstantial evidence for a microbial origin of natural products isolated from marine microorganisms also exists for many marine invertebrates. For example, the active compound isolated from the mollusk *Dolabella auricularia* is also found in the blue-green alga *Symploca hydnoides* (Harrigan *et al.* 1998). Clearly, isolation and cultivation of microbial producers of active compounds provide an alternative to facilitate the sustainable supply of these organisms. This can be a viable and cost-effective approach provided that appropriate microbe culture techniques are available. However, this does not seem to be the case for some marine symbionts.

14 Organisms whose cells have chromosomes with nucleosomal structure and separated from the cytoplasm by a two membrane nuclear envelope and compartmentalization of a function in distinct cytoplasmic organelles.

4.3 Extremophiles

In the last decade scientists have been particularly interested in a largely unexplored group of microorganisms that thrive in extreme environments. Some estimate that there are about 2 million species of bacteria in the sea and close to 4 million species of these organisms in a ton of soil (Curtis *et al.* 2002). Similarly there are about 1.5 million species of fungus in an average soil sample and only 100,000 have been described (Hawksworth 2004).

Diversa Corporation, Genencor International, Novozymes, and Vicuron Pharmaceuticals are just a handful of companies that have taken advantage of this diversity. They collect samples of bacteria and fungi that have multiple applications in the pharmaceutical, biotech, agribusiness, chemical, cleaning, and food industries. These companies also have great interest in the so-called extremophiles (or extreme-loving organisms), which include bacteria, archaea,[15] protists,[16] and eukaryotes that live under extreme conditions that would usually kill other creatures. Scientists have identified several categories of extremophiles that include the following:

- Acidophiles or acid-loving organisms live in habitats that present pH values less than 2 (e.g., the archaea *Ferroplasma acidiphilum* can catalyze the accelerated dissolution of sulfidic minerals in industrial tank bioleaching operations) (Okibe *et al.* 2003).

- Alkalophiles or alkaliphiles thrive in acidic conditions at pH values higher than 10. (e.g., a species of *Streptomycetes* collected from the soda mud flats on the shores of the alkaline Lake Nakuru in Kenya is the source of a cellulase isolated by a Dutch academic researcher, and later commercialized by Genencor International to create the popular stonewashed look in denim jeans (http://www.genencor.com/wt/print/biodiversity).

- Barophiles or piezophiles are organisms that need high pressures to grow. Recovered at great ocean depths, some of these organisms require pressures hundreds of times greater than that on Earth's surface to survive (e.g., *Photobacterium profundum* is found where pressures reach 25 megapascals and it is an excellent model for studying adaptation to cold temperatures and high pressures) (Vezzi *et al.* 2005).

- Anaerobes are organisms that do not require oxygen to carry out respiration. Some strict anaerobes are actually inhibited from growing in the presence of oxygen (e.g., bacterium *Bacillus infernos* or 'bacillus from hell' is not only anaerobic but also thermophilic. It was obtained at a depth of approximately 2,700 m below the land surface) (Boone *et al.* 1995).

- Halophiles or salt-loving organisms inhabit environments consisting of 20 to 30% salt (e.g., the bacterium *Halobacterium halobium* has a protein known as bacteriorhodopsin which is light sensitive and is used in optical switches) (Roy *et al.* 2002).

- Psychrophiles or cold-loving organisms (e.g., bacterium *Polamorolas vacuolata*, found in Antarctica grows best at 4°C and cannot survive at temperatures above 12°C). Some of these organisms have enzymes that work at refrigerator temperatures and might have applications in the food industry. They also help clean up artic oil spills (Madigan and Marrs 1997).

- Thermophiles and hyperthermophiles are heat-loving organisms that grow at temperatures between 50 and 70°C (e.g., the frequently cited bacterium *Thermus aquaticus* found in the 1960s in a hot spring in Yellowstone National Park (US) and source of the enzyme *Taq* polymerase used in the multimillion Polymerase Chain Reaction (PCR) technique used for the replication of DNA) (Brock 1997).

15 This is a unique group of microorganisms. They appear to be living fossils, the survivors of an ancient group of organisms that bridged the gap in evolution between bacteria and the eukaryotes (multicellular organisms). The name archaea comes from the Greek archaios meaning ancient.

16 Members of Protista which is the kingdom of eukaryotic unicellular, colonial and multicellular (without tissue specialization) organisms. It includes the Protozoa, unicellular eukaryotic algae and some fungi (myxomycetes, acrasiales and oomycetes).

4.4 Natural products discovery: The role of modern technologies

Extremophiles can be found in both terrestrial and marine ecosystems and some of them have also been discovered in the most unusual places and circumstances. In 1956, the bacterium *Deinococcus radiodurans* was found in cans of meat that had been exposed to supposedly sterilizing doses of radiation. This is the most radiation-resistant organism known to man. It can withstand exposure to radiation levels up to 1.5 million rads (500 rads is lethal to humans). A recombinant strain of this bacterium has been engineered to degrade organopollutants in radioactive, mixed-waste environments (Cavicchioli and Thomas 2000). Genetic engineering techniques used to create this strain of bacterium paved the way for several technologies that have facilitated the discovery of natural products in the last decade. The next section provides an overview of the role of these and other technologies.

In the last 40 years or so, scientists have defined the underpinnings of the scientific process of discovery of natural products (i.e., chemical compounds with pharmaceutical, agrochemical, or other industrial uses) which in most cases is usually initiated with the isolation of crude extracts from biological organisms that are purified through a technique known as pre-fractionation. This technique basically increases the concentration of the chemical compounds. The purified extracts are then tested in biological assays in order to identify chemical compounds that are active against a human or plant disease. Subsequently, the chemical compound can either: a) be isolated, purified and used as a drug or agrochemical; b) require structural modification to increase potency and specificity; or c) be used to develop analogs that are structurally less complex and easy to synthesize in the laboratory (ten Kate and Laird 1999, Rosenthal *et al.* 1999).

In the last two decades, modern technologies have not only improved the diversity and accuracy of screens but also facilitated and accelerated steps (b) and (c). Furthermore, developments in genomics, bioinformatics, and novel genetic engineering techniques have turned bacteria into factories for the production of large quantities of natural products. This section presents an overview of the linkages between these and other techniques that promote the mutation and evolution of genes and their contribution for the production of natural products in future decades.

4.4.1 Accelerating the natural product discovery process: Genes, targets, and assays

In the last few decades, as underscored in the previous section, scientists have standardized the scientific process of discovery of natural products. In 1995, a major contribution to the field occurred with the availability of the complete genomic sequence of the first living bacterium *Haemophilus influenzae* which opened the field of microbial genomics. Since then, over 100 microbial genomes have been completely sequenced and published and another 200 are estimated to be in progress worldwide. Beyond sequencing, there have been major advances in the field of functional genomics where whole genomes are being characterized in more detail using proteomics and microarray technologies. DNA microarrays, for example, allow for the identification of genes that are turned on or off under different environmental conditions on a genome-wide scale. Also, comparative genome hybridization (CGH) studies that employ DNA microarrays are revealing the extent of diversity across arrays of related and unrelated microbial species (Nelson 2004).

Developments in genomics, proteome analysis, and bioinformatics have also enabled scientists to gain a better understanding of the chemical pathways and reactions in living organisms which have led to the identification of new targets for drugs. The targets are proteins produced by genes that cause the disease. Once the genetic basis of a disease and the proteins involved in its phenotype have been elucidated, these proteins can be used as targets in high-throughput screening (HTS) for drug development. Advances in gene technology have also allowed the speeding up of screening programs for new compounds through the development of more sophisticated *in vitro* assays. For example, genes encoding receptor proteins for certain classes of drugs or enzymes may serve as targets for novel drugs or pesticides that may be cloned and expressed on a large scale in high-throughput *in vitro* assays into which thousands of plant extracts may be applied (Schmid 2003).

As well as finding a suitable target, an important part of the challenge of designing an assay is to find a way to detect whether the compound being tested for its potential effect as a drug does or does not produce the desired result on the target. Thus, an assay usually involves some indicator, a chemical which changes color or reveals in some manner whether the potential drug molecule has interacted biologically or chemically with the target, for example, by killing a cell or rendering an enzyme inactive. There are mechanism-based and whole-organism assays. Mechanism-based assays use individual biochemicals such as enzymes or receptors isolated from cells that will reveal specific biological activity when combined with the chemical to be screened. In this case a collection or library of chemicals to be tested is built and maintained. Each of the chemicals will be tested many times against an ever-changing array of mechanism-based assays. Mechanism-based assays are often changed every three months (Kingston *et al.* 1999).

On the other hand, whole-organism assays operate *in vivo* and expose an entire cell to the chemical being screened, enabling the potential drug to operate through a range of different mechanisms during the one test. In this approach the assay remains the same. New assays are continually being developed and very few, if any, plants have been screened using all the techniques now available. Also the pattern of disease distribution is not static. As some diseases are brought under control others gain prominence and new ones evolve.

In addition to an increasing understanding of genes, targets, and assays, advances in miniaturization and automation of HTS have accelerated the discovery process of new pharmaceuticals. This means that many more biochemical compounds can be screened more rapidly and effectively. HTS screening can test over 1.1 million compounds in six months (Schmid 2003).

4.4.2 Combinatorial chemistry: Exploring the linkages with natural products

Combinatorial chemistry is part of an increasing set of tools and procedures to expedite the discovery process of pharmaceuticals and agrochemicals. Combinatorial chemistry allows the generation of a huge number of chemical compounds for screening. This is based on the idea that all but the smallest organic molecules can be thought of as made up of modules which can be assembled in many ways. By going through all the possible combinations a huge number of molecules can be created from a small number of starting modules.

Combinatorial chemistry techniques have been used to create large numbers of organic molecules called libraries that can be screened at one time. In the past, chemists have traditionally made one compound at a time. For example, compound A may have been reacted with compound B in order to produce compound AB which may have been isolated and purified through crystallization, distillation, or chromatography. In contrast, combinatorial chemistry offers the potential to make every combination of compound A1 to Ax and compound B1 to Bx. The range of combinatorial techniques is quite diverse and these compounds can be made individually in a parallel or in mixtures, using either solution or solid phase techniques (Schmid 2003).

These techniques have allowed an exponential increase in productivity never seen before. In the last century, scientists may have reported the existence of several million biochemical compounds, but today using combinatorial chemistry techniques it is possible that new discoveries will surpass that total amount in a relatively short period of time. Furthermore, in the 1970s a traditional chemist was able to produce about four compounds in a month at a cost per compound estimated to be about US$7,500. Today, using combinatorial chemistry techniques the same chemist can produce over 3,000 compounds in the same period of time at a cost per compound of about US$12 (Borman 1998). This is possible not only due to a convergence of chemistry and biology but also because of fundamental advances in miniaturization and robotics. This relatively new field has captured the attention of scientists in the pharmaceutical, biotechnology, agrochemical, and other industrial areas.

After almost two decades, however, as the poor record of development of novel products demonstrates, combinatorial chemistry has not led to many successful products. Furthermore, half of the ten best-selling drugs are derived from secondary metabolites originally isolated from microorganisms or plants. Organic chemistry has not caught up with the capacity of nature to create new structures with a complex molecular diversity. Chemists have the building blocks but they need

the directions in order to put them together in a manner that provides benefits to society. The natural world offers the manual. Some argue that organisms making natural products have been conducting combinatorial chemistry and have been screening for activity for hundreds of millions of years before humans adopted a similar strategy (Firn and Jones 1998). The deadly South Pacific cone snail, for example, uses a highly effective peptide toxin to paralyze its prey. This toxin is a mixture of 100 or more venoms produced by the combinatorial scrambling of amino acids that has taken place over 30 to 50 million years of evolutionary history of the cone snail. There are more than 500 species of cone snails, each able to produce more than a hundred unique toxins and they are yielding new treatments for pain, epilepsy, and incontinence (*see* section 'Marine organisms', this chapter).

Some argue that the number of possible new drug and agrochemical targets (e.g., proteins produced by genes that cause the disease) has already outgrown the number of existing compounds that could potentially serve as drug candidates. Nonetheless, classical combinatorial chemistry has its limits when it comes to synthesizing new molecules. Also, rational drug design, although successfully used to develop HIV protease inhibitors, is still in its infancy. Naturally occurring compounds account for about one-third of the products that comprise the US$500 billion industry (ten Kate and Laird 1999). Natural products will stay valuable for pharmaceutical, biotechnology, and agrochemical industries due to their wide structural diversity, their excellent adaptation to biologically active structures, and their genetic diversity. Furthermore, in the last few years, recombinant DNA techniques popularly termed 'gene cloning', 'genetic engineering', or 'synthetic biology' have taken advantage of this genetic diversity and offered unlimited opportunities for creating new combinations of genes and natural products.

4.4.3 Genetic engineering and bioprospecting

Genetic engineering is the formation of combinations of heritable material by the insertion of nucleic acid molecules produced by whatever means outside the cell into any virus, bacterial, and plasmid on another vector so as to allow their incorporation into a host organism in which they do not naturally occur but in which they are capable of continued propagation. In essence, gene technology is the modification of the genetic properties of an organism by the use of recombinant DNA technology. Genes are the biological software that drive the growth of organisms.

Recombinant genes found in wild biodiversity used to be more important for agriculture[17] than for the pharmaceutical or biotechnology industries but this is changing. The transfer into plants or microbes of genes from viruses, bacteria, animals, and plants is becoming a standard practice in the pharmaceutical, agrochemical, food, cleaning, and other biotechnology industries. In these industries, recombinant DNA research and development does not require the same amount of random screening carried out in traditional bioprospecting practices. Recombinant pharmaceuticals, agrochemicals, and other biotechnology products are primarily the result of a product-orientated engineering approach (Schmid 2003). In this context, bioprospecting has become a strategy to accumulate and develop libraries of novel genes and proteins from plants, animals, and microbes that are used according to specific needs and circumstances. For example, leeches have been used in traditional medicine to treat thrombosis since ancient times. The active principle from their saliva, the protein hirudin, is now an ingredient of numerous ointments and gels used against varicosis and hemorrhoids. Genetic engineering techniques have facilitated the development of recombinant hirudin that is now being produced by *Escherichia coli* (Schmid 2003).

4.4.3.1 Generating chemical diversity through bioprospecting and synthetic biology

Today, the search for plants, animals, and microbes with pharmaceutical, agrochemical, and other industrial purposes offer many opportunities for the discovery of genes coding for enzymes and proteins involved in natural-product biosynthesis, many of which might be expected to have a broad substrate tolerance. The addition of these genes to organisms with existing rich natural product diversity should generate even more chemical diversity

17 Classical breeding has traditionally used genes from wild ancestors of cultivated plants and animals to promote pest resistance and develop new and improved crop variations or livestock breeds.

producing chemical structures that currently lie beyond the scope of combinatorial chemistry. This is the premise of the so-called relatively new field of synthetic biology which involves taking genes and their metabolic pathways found in nature and grafting them into the genetic code of a microbe. The microbe or host organism reproduces and expresses the added genes through the production of natural products.

The term 'synthetic' comes from the fact that the resulting natural product comes out of an organism with a genetic code that is not ordinarily found in nature. For example, the malaria-fighting compound artemisinin is naturally produced by the wormwood (*Artemisia annua*), a plant indigenous to Africa and Asia, but in very low quantities. Scientists at the University of California, Berkeley are trying to increase the production level of artemisinin in order to reduce its cost for poor consumers by extracting the artemisinin-producing genes from the wormwood plant and inserting them into the common yeast used in breads and beer. In early 2006, after almost three years of work, the scientists proved that the yeast can produce artemisinic acid, a chemical precursor of artemisinin. Now chemists can use a simple and inexpensive purification process to turn artemisinic acid into the drug artemisinin. Although the yeast is capable of producing artemisinic acid at a higher level of productivity than the wormwood plant, industrial scale-up is required to raise artemisinic acid production to a level high enough in order to reduce the cost of artemisinin therapies (Ro *et al.* 2006). This process is likely to take two to four years (Hoffman 2006).

A few years ago, DuPont scientists pursued a similar synthetic biology experiment by transplanting six genes from two different microorganisms into one microbe. The microbe produced four different enzymes that together turn affordable, corn-derived glucose into propanediol the key ingredient of Sorona, a soft static-resistant polymer DuPont markets as an alternative to polyester and nylon. Before this procedure was designed, instead of the affordable glucose, DuPont scientists were using petroleum for the production of Sorona. This new technology allowed not only a reduction in costs but also in toxic byproducts (Weintraub 2004).

Similar initiatives have been pursued by the enzyme industry. Genencor International, for example, obtained extremophile bacteria that had bee collected by academic researchers (*see* section 'Extremophiles', this chapter) in a highly alkaline lake in East Africa that included genes used to create enzymes for the laundry detergent Tide. The extremophile genes responsible for making these enzymes were genetically engineered into the commonplace bacteria *E. coli* which was then grown massively in giant brewers' vats. It should be noted that Genencor International has over 15,000 strains of microbes stored in deep-freezers in Palo Alto, CA and the Netherlands. Such potential has delivered 11 products that involve the use of living material, enzymes, and proteins to develop cleaner and cheaper ways of making industrial chemicals.

4.4.3.2 Creating protein diversity through directed evolution

'Directed evolution' is a procedure used in genetic engineering to evolve proteins or RNA with desirable properties not found in nature. Directed evolution is usually guided toward a predetermined goal resulting largely in the accumulation of adaptive mutations, whereas natural evolution accumulates adaptive and neutral mutations. The type of properties targeted in *in vitro* evolution often goes beyond requirements that would make biological sense.

The directed evolution technique involves the following three steps: 1) Diversification: The gene encoding a protein of interest is mutated or recombined at random in order to develop a large library of gene variants; 2) Selection: the library is tested for the presence of mutants that exhibit the desired properties using an assay or screen and; 3) Amplification: the mutants identified by the assay are replicated in order to allow scientists understand the type of mutations that have occurred. Directed evolution can be carried out in living cells (*in vivo*) or directly in DNA (*in vitro).* Unlike *in vivo* directed evolution, *in vitro* experiments can generate large DNA libraries. Directed evolution in which as genome sequencing projects continue to grow, promises to become a principal route for search and discovery.

This technique indeed offers a totally new dimension for bioprospecting. The first successful examples of protein or amino acid sequence improvements are the results of screening genes from the wild. Calcitonin is a peptide hormone that inhibits the release of calcium ions and phosphate from the bones and has therapeutic uses for osteoporosis. Research on related hormones from

animals revealed that the calcitonin from salmon is more active and has a longer half-life within the human body than the human peptide structure. Protein engineering based on computer simulation and combinatorial chemistry techniques are very powerful tools that can take advantage of the genetic diversity offered by the natural world in order to develop new biotechnology products (Otten and Quax 2005).

4.4.3.3 Harvesting the potential of microorganisms through site-directed mutagenesis

Companies such as Genencor International and Diversa Corporation have managed to isolate DNA from environmental samples without culturing and to accelerate the evolution of its genes through a technique known as site-directed mutagenesis. This is a technique in which a mutation is created at a defined site in a DNA molecule.

Site-directed mutagenesis generates diversity by specific random or cyclic mutagenesis approaches. Thus, scientists are able to generate large information-rich libraries of unique molecules. The selection and screening possibilities are knowledge based, high throughput, and product oriented. The libraries generated are screened for the targeted properties and the best candidate is selected. They perform protein engineering augmented by knowledge derived from structures determined by x-ray crystallography, computational homology modeling, rapid protein characterization, and structure/function relationship analysis to create new products. Scientists have determined over 100 structures for different enzymes including proteases, lipases, amylases, and cellulases. If scientists are unable to find an enzyme to solve a specific problem in nature they are able to develop it by imitating evolution (i.e., molecular evolution). They replicate mutation and recombination in lab conditions. By forcing enzymes to evolve, many new enzyme products are discovered.

The company Diversa Corporation, for example, uses a genomic approach in which DNA is isolated directly from environmental samples without culturing. Using Diversa Corporation's gene site-saturation mutagenesis (i.e., a variation of site-directed mutagenesis) and turntable gene reassembly this company has been able to evolve genes in order to create multiple variants based on the original nucleic acid. These genes are then screened for characteristics and activity required for the end product or application. The resulting nucleic acid is then included into Diversa Corporation's proprietary environmental gene libraries which are then screened for a host of various products. Diversa Corporation's unique proprietary approach to discover and evolve novel genes has created environmental libraries comprising millions of genomes. For example, Diversa Corporation marketed a custom enzyme (Luminase) for bleaching paper. The enzyme was collected from organisms collected in a soil sample found near geysers in Russia and then it was engineered to work at different temperatures and alkaline levels (Kretz *et al.* 2004).

4.5 Science and its implications for ABS agreements

Recent scientific findings such as the role of most symbionts (e.g., algae, bacteria, and fungus) as the true producers of natural products and novel technologies that can turn genetically altered bacteria into factories for the production of natural products suggest that both users and providers of genetic resources need to negotiate ABS agreements that reflect these scientific developments and trends. This section underscores key implications of these and other scientific issues that are relevant for bioprospecting ventures. These implications are described in the context of the following activities that are usually addressed by most ABS agreements: a) identifying biological samples, b) supplying biological samples, and c) transferring technology and building capacity.

4.5.1 Identifying biological samples: Are these samples the true sources of natural products?

Successful providers of genetic resources have relied on their expertise to identify biological samples as a strategy to add value to samples and to protect their identity. Organizations such as the Costa Rican National Biodiversity Institute (INBio) (*see* Costa Rican Chapter No 5, this volume) have developed a barcoding technology to tag and track specimens. This is a key component of the INBio inventorying process and information system that is particularly well developed for plants. Since INBio has already identified over 90% of all Costa Rican plants, this provides a comparative advantage in the negotiation of ABS agreements relating to collection of plant species,

because there is an implicit assumption that the identity of the plant will be the same as the identity of the source of the natural product. Nevertheless, increasing evidence indicates that in many cases the producers of natural products are not the plants and animals themselves but the fungi, algae, bacteria, and other microbes that live in association with these organisms (*see* section 'Symbionts: Are They the True Sources of Natural Products?', this chapter).

This discovery presents a new technical challenge to all providers of these resources if they want to provide the identity of the sample as an element to add value to the bioprospecting process and the negotiation of ABS agreements. Many of the chemotaxonomy and genomic techniques available to identify algae, fungus, and bacteria are very expensive and are currently available in very few well-equipped laboratories based in developed countries.

4.5.1.1 Identifying microbes: A new challenge for the providers of genetic resources

Several chemotaxonomy and DNA fingerprinting methods for the classification of microbes are available and relatively useful, but each has specific limitations and are data dependent. For example, bacterial phylogenetic classification is based on a sequence analysis of the small subunit 16S ribosomal RNA molecule or its genes (Priest 2004). A major limitation of this approach is that small ribosomal subunit sequencing is not suited for large numbers of isolates that could be provided by bioprospecting initiatives. Therefore, this method is often combined with high-throughput methods such as Fourier-transform infrared spectroscopy. The Center for Microbial Ecology of Michigan State University promoted this concept by establishing a publicly available database that facilitates the identification of bacteria by providing the scientific community with ribosomal RNA phylogenetic trees and ribosome-related data (http://rdp.cme.msu.edu/).

The identification and classification of bacteria and other prokaryotes (i.e., organisms without a cell nucleus) is markedly data dependent and it is still relatively data poor. Moreover, classification procedures are in a constant state of change with each influx of new technology and new data. Prokaryotic systematics is wrestling with the imbalance between high-throughput sequencing and the concept of polyphasic taxonomy.[18] It should be emphasized that currently bacterial taxonomy is reliable only at the level of broad phylogenetic groups (well delineated by even partial 16S sequences) and at the species level with certain well-studied taxa such as the genus *Mycobacterium*. For many genera, identification of species remains a major problem as exemplified by the genera *Nocardia* and *Rhodococcus* (Goodfellow and O'Donnell 1993).

Chemotaxonomy is another approach that has been useful to identify plants, bacteria, and other microorganisms. Chemical data from the analysis of whole organisms and cell components using methods such as gas, thin-layer, and high-performance liquid chromatography, have been used extensively to classify microorganisms according to the discontinuous distribution of specific compounds. Chemotaxonomic analysis of macromolecules, especially aminoacids and peptides, isoprenoid quinines, lipids, polysaccharides and related polymers, proteins, and enzymes were used to classify innumerable taxa prior to the introduction of 16S rDNA sequencing. Chemotaxonomic data proved to be of particular value in the classification of the actinomycetes and coryneform bacteria which initially was essentially morphological in concept. Data from amino acid and sugar analyses promoted an extensive reappraisal of the classification of these taxa (Goodfellow and O'Donnell 1993, Priest 2004).

Chemotaxonomy is also contributing to polyphasic taxonomic characterization and it will continue to be important with the availability of high-throughput chemical fingerprinting methods for characterization and identification such as Fourier-transform infrared spectroscopy, pyrolosis mass spectrometry, matrix-assisted laser desorption-ionization with time of flight and spray-ionization mass spectrometry. These high-throughput chemical fingerprinting methods offer the possibility of integration between genomic and phenotypic characterization of organisms which are important, if one is to understand much of the current data and to exploit technology to solve the major problem of rapid and reliable

18 Polyphasic taxonomy considers all available phenotypic and genotypic data of bacteria and integrates them in a consensus type of classification, framed in a general phylogeny derived from 16S rRNA sequence analysis. In some cases, the consensus classification is a compromise containing a minimum of contradictions. It is thought that the more parameters that will become available in the future, the more polyphasic classification will gain stability (Vandamme *et al.* 1996).

identification of microbes. In general, good congruence has been found between the discontinuous distribution of chemical markers and the positions of the corresponding taxa in the phylogenetic tree as clearly shown with respect to actinomycetes (Priest 2004).

This technology, despite its limitations, is important, particularly in those bioprospecting projects where taxonomy has to be assessed and this increases the likelihood of getting a good bioprospecting deal. But an organism should be identified only when a promising lead natural product is identified. Negotiating the inclusion of molecular and genomic taxonomy efforts into agreements is an important option for providers of genetic resources. Nevertheless, if synthetic, semi-synthetic or genetically engineered derivatives are the final product then the user will not need to re-supply by acquiring additional samples. In this case, the identification of the original biological sample is relevant only for scientific purposes.

4.5.2 Supplying biological samples: A new paradigm determined by science and technology

Increasingly, evidence is showing that many of the compounds isolated from marine organisms are produced by symbiont microorganisms. In addition, scientists are focusing on the potential offered by microorganisms including extremophilic bacteria, fungi, and algae. This finding is consistent with INBio reports regarding international requests to collect microorganisms in Costa Rica (*see* Costa Rican Chapter No. 5, this volume). The advance development of a drug or agrochemical usually requires access to large quantities of the source raw material for production of sufficient drug for preclinical/clinical and product development. As previous sections indicate, new scientific techniques have been developed to grow fungi, algae, bacteria, and other microorganisms in *in situ* and *ex situ* conditions. Many of these microbes live in symbiosis or association with other organisms such as plants and marine invertebrates. In most cases, the symbionts can be isolated and cultured in the laboratory in order to obtain large quantities of the active compound. In other cases, both organisms, the host and symbiont, have to be grown together in *in situ* conditions through mariculture or aquaculture techniques.

Marine sponges, for example, are known to include cyanobacterial symbionts that produce secondary metabolites with pharmaceutical potential. A few years ago, scientists assessed the technical and economical potential of using marine sponges for large-scale production of these compounds for two cases: a) the anticancer molecule halichondrin B from *Lissodendoryx* sp. and b) avarol from *Dysidea avara* for its antipsoriasis activity. An economic and technical analysis was done for three potential production methods: a) mariculture, b) *ex situ* culture (in tanks), and c) cell culture. The conclusions indicated that avarol produced by mariculture or *ex situ* culture could become a viable alternative to currently used pharmaceuticals for the treatment of psoriasis. Production of halichondrin B from sponge biomass was found not to be a feasible process, mainly due to the extremely low concentration of the compound in the sponge (Sipkema *et al.* 2005).

On the other hand, some marine chemical products are naturally more amenable to economical production via laboratory synthesis or semi-synthesis. This is usually related to either the overall complexity of the model compound and/or the number and nature of the steps contained in the biosynthetic pathway. For example, the structural simplicity of some compounds such as dolastatin (originally derived from the sea hare *Dolabella auricularia*, but found to be cyanobacterial in origin (Luesch *et al.* 2002) make them prime candidates for their total synthesis. In contrast, a natural product such as ecteinascidin 743 (ET-743) with 60 or more steps required for complete synthesis (Luesch *et al.* 2002), may never be economically produced in its entirety by synthetic chemists. Analogs of this complex compound, however, can be produced through a semi-synthetic strategy that starts with and builds on one or more precursor molecules. For example, efficient semi-synthetic production of ET-743 has been attained by using the closely related compound safracin B as a starting point. This natural product is produced by an easily culturable pseudomonad bacterium, allowing sustainable and cost-effective semisynthetic production of ET-743 (Luesch *et al.* 2002). Table 1 lists selected current natural products derived from marine organisms that are being cultured in *in situ* and *ex situ* conditions and manufactured via laboratory synthesis or semi-synthesis.

Genomic approaches have also been developed to ensure a sustainable supply of natural products. For example, scientists are working on approaches to:

- Isolate the organism's genes that can subsequently be used to produce the natural product in another organism (e.g., synthetic biology), For example, the bioprospecting program of the Bermuda Biological Station for Research is developing techniques for cloning genes from the host macrofauna and associated microbial symbionts of sponges and other marine invertebrates and inserting them into laboratory bacterial strains (http://www.sciencemag.org/cgi/content/abstract/sci;1093857v1). The hope is that targeted natural products can be sustainably produced using such a strategy, even if the microbial agents responsible for them remain unable to be cultured or even identified.

- Facilitate the identification and expression of gene clusters from microbes (e.g., fungi such as actinomycetes) that do not produce metabolites in natural conditions (Streit and Schmitz 2004).

- Evolve genes that can be screened later against a desired property for a specific product (*see* section 'Genetic Engineering and Bioprospecting', this chapter).

- Screen for a diversity of enzymes in a microbial community. This process, metagenomics, is a creative approach in screening for a diversity of enzymes and is close to the idea of screening a biodiversity library. It is thought to be an elegant strategy in light of the fact that it does not rely on the cultivation of microorganisms, but instead on DNA or mRNA that is directly isolated from an environmental sample, purified, digested, and cloned into suitable cloning vectors to construct complex environmental libraries. These gene libraries are screened using either sequence-based techniques or activity assays. Ideally, cultivation-independent approaches enable microbiologists to fully exploit the biological potential of a microbial community in its totality (Streit and Schmitz 2004).

While production of marine and microbe-based natural products via laboratory synthesis and genetically engineered approaches gets around the need to re-supply samples, the complexity of the molecular structure of compounds and the cutting-edge techniques employed will, no doubt, continue to present their own formidable challenges and limitations. Therefore, in many cases the only re-supply alternative will come from the cultivation and/or recollection of the organism itself under ABS agreements.

In any case, providers of genetic resources should seek to have access to the know-how and equipment needed to re-supply biological samples through any of the scientific technologies described above. In addition ABS agreements that involve supplying live samples of microbes and other organisms must be carefully evaluated because the sample itself is sufficient to provide endless quantities of the active compound or natural product in most cases. Contractual provisions should be negotiated in order to obtain as much information as possible regarding the future use of these samples. This includes reporting and auditing protocols. Also it must be emphasized that the country is the owner of samples and it should be compensated in case of future benefits. If the organism can be cultured and useful genes can be identified and isolated there would not be any dependence on the original source, hence no need to re-supply or to negotiate prices per sample. On the positive side, this would prevent the environmental impact caused by collecting large amounts of the resource in its original habitat.

4.5.3 Transferring technology and building capacity: Are science and technology affecting the choices made by negotiators of ABS agreements?

As underscored above, the total synthesis or semi-synthesis of a drug may be possible, nevertheless the structural and stereochemical complexity of most natural compounds often preclude the development of economically feasible large-scale total syntheses. Similarly, pursuing the development of natural products derived from gene clusters or from microbes grown in lab conditions through synthetic biology and other genetic engineering techniques can be a dead-end initiative. In most cases these are knowledge intensive and multi-year-long enterprises (*see* section 'Genetic Engineering and Bioprospecting', this chapter). Nevertheless, there are companies that

have successfully applied these cutting edge technologies for the development of natural products (Brush and Carrizosa 2004).

Cutting edge technologies used in the activities described in this Chapter are expensive and difficult for developing countries and their scientific bodies to obtain. Indeed, if those technologies are closely held and used exclusively by the user, may be completely inaccessible for use by countries that provide genetic resources, even if other capacity issues were not a barrier to direct laboratory bioprospecting. Nevertheless, non-proprietary gene and molecular technology is being transferred to providers of genetic resources in the form of protocols, equipment, and training negotiated in the context of ABS agreements (*see* Costa Rican, NCI and Panama chapters, this volume). For example, since 1991 INBio has increased its capacity by negotiating technology transfer and training provisions with partners such as Phytera, Diversa Corporation, the International Cooperative Biodiversity Groups (ICBG), the Global Environment Facility (GEF), Merck & Co, and the Costa Rica-United States of America Foundation for Cooperation. Consequently, INBio has been able to establish the following laboratories that provide important added value to present and future bioprospecting ventures:

- Plant biotechnology laboratory: carries out sterilization procedures, preparation of media, includes transference and culture rooms used for micropropagation of plant material.
- Molecular biology laboratory: performs DNA extraction and PCR.
- Microbiology laboratory: provides isolation and culture of bacteria and actinomycetes.
- Mycology laboratory: carries out activities that range from isolation to taxonomic identification of fungus.
- Chemical laboratory: carries out extraction, fractionation (BioXplore Technology), and nuclear magnetic resonance services.
- Informatics unit: provides tailor-made databases according to each agreement (BioXplore Technology) (*see* Costa Rican Chapter No. 5, this volume).

Conclusions

INBio's relationship with users of genetic resources has definitely set a precedent followed by other providers of genetic resources. For example, the Panamanian ICBG (*see* Chapter No. 7, this volume) shows that local organizations have gained access to novel biotechnologies for bioassays and nonradioactive visualizing techniques. These technologies have allowed these organizations to carry out experiments almost independently of a large laboratory and supply-chain infrastructure, making them 'portable' or analogous to 'field techniques'. Ten years ago, such technology was not so portable. In Panama, this technology has made it possible for support for the training and outfitting of in-country scientists through negotiated ABS agreements. Ten years ago, the emphasis would have been more on up-front payments or royalties, because trained Panamanian scientists and parascientists wouldn't have had a place to work in Panama. The Costa Rican and Panamanian experiences are clear examples of how the impact of science and technology affect the options available to negotiators of ABS agreements.

One of the greatest challenges in exploiting the enormous potential benefits of marine and terrestrial natural products is the difficulty in finding sustainable means of production for compounds of interest. Achieving this goal, however, may create an increased difficulty for providers seeking to ensure that users obtain ABS permissions, and share benefits arising from genetic resources that originated in their country. Having sustainable supplies is critical if a chemical is to be marketed as a drug, agrochemical, or other product. Reliable production is also a necessity to support the research needed to study and understand novel compounds before commercial potential can even be evaluated. Today, important developments in chemistry, molecular biology, and genomics provide a comprehensive menu of technologies that address supply and product development issues and contribute to the identification of microbial samples. Furthermore, technologies that mutate genes in order to develop new products (*see* section 'Harvesting the Potential of Microorganisms Through Site-Directed Mu-

tagenesis', this chapter) should raise not only monetary but also ethical concerns among providers of genetic resources. These scientific and technological developments should influence the negotiation of supply, benefit-sharing, monitoring, and other relevant provisions of present and future ABS agreements.

Pharmaceutical and biotechnology companies seeking access to work with microbes are also provoking the anxiety of source countries over samples that do not require re-supply for development. There is no longer the control point that results from the need to recollect. In plants the ability to do synthetic biology raises similar concerns (*see* section 'Generating Chemical Diversity through Bioprospecting and Synthetic Biology', this chapter). Furthermore, providers of genetic resources are concerned about potential income and technology-transfer opportunities lost to scientific endeavors such as Craig Venter's efforts to decode and complete genome sequences of organisms (information on Venter's research can be reviewed at http://www.jcvi.org/). There is also some concern that, by making this information public, these researchers are jeopardizing the ability of countries to protect the value of genetic resources over which they have undisputed sovereign rights. The implication of this is that the free international flow of gene sequences may ultimately make control of genetic resources irrelevant. Since these efforts will increase dramatically in the future, source countries may want to strengthen and accelerate efforts to take advantage of opportunities to develop local capacity in order use their genetic diversity before it becomes public and looses its economic potential.

Scientific and technological developments are also the core and competitive advantage of companies based in industrialized countries. These companies are concerned that their competitive edge will be compromised if proprietary bioassays, molecular biology approaches and genomic technologies, as well as the nature of any specific leads, or the financial terms of an agreement are shared with parties peripheral to the parties to ABS agreements. Consequently, transfer of technology to providers of genetic resources is unlikely to include state-of-the-art equipment and know-how. Nevertheless, many companies are willing to transfer basic gene technology which in contrast to natural-compound chemistry does not particularly require expensive investments in laboratory equipment.

Table 1 Selected marine natural compounds currently under development as drugs (Compiled from Fenical 2006, Maxwell 2005, Kijjoa and Sawangwong 2004, Proksch et al 2002 and 2003, Haefner 2003, and Faulkner 2000)

Compound	Source	Therapeutic area	Organization and development phase	Comments
ACV1	*Conus victoriae* (mollusk)	Analgesic	Discovered by University of Melbourne (Australia) and developed by Metabolic Pharma (Australia), Clinical Trials-Phase I and II.	This group of cone snails has evolved a rich cocktail of peptides in their venom, which act together by a variety of mechanisms in the nervous system to quickly immobilize or kill their prey.
Aplidine, also known as Aplidin®	*Aplidium albicans* (tunicate)-Mediterranean	Anticancer	Discovered by University of Illinois (USA) and developed by PharmaMar (Spain), Clinical Trial- Phase II.	Originally isolated from the tunicate, today this compound is manufactured synthetically.
Bryostatin 1	*Bugula neritina* (bryozoan)-California and the Gulf of Mexico	Anticancer	Licensed to GPC Biotech (Germany) by Arizona State University (USA), Clinical Trial- Phase II.	*B. neritina* has been cultured in in-sea and on-land conditions to supply clinical trials of Bryostatin 1. However, supply is not adequate if the compound were to be marketed. Total synthesis of the compound was also achieved but it may not be economically feasible due to low yields.
Cematodin	Synthetic derivative of Dolastatin 15 (*see* Dolastatin 10 and ILX-651 and TZT-1027)	Anticancer	Discovered by Arizona State University (USA) and developed by Abbot Pharmaceuticals, Clinical Trial-Phase II.	The structural simplicity of this compound makes total synthesis a more viable option for supplying clinical trials than microbial culture (i.e., from cyanobacterias).
CGX-1160	*Conus geographus* (mollusk)	Analgesic	Developed by Cognetix (USA) and Elan Corporation (Ireland), Clinical Trial- Phases I and II.	This group of cone snails has evolved a rich cocktail of peptides in their venom, which act together by a variety of mechanisms in the nervous system to quickly immobilize or kill their prey.
Curacin A	*Lyngbya majuscula* (cyanobacteria)-Caribbean region	Anticancer	Discovered by Scripps Institution of Oceanography (USA), Preclinical.	A synthetic version was already developed.
Discodermolide	*Discodermia dissoluta* (sponge)-The Bahamas	Anticancer	Discovered by Harbor Branch (USA) and licensed to Novartis (USA) for development, Clinical Trial-Phases I and II.	Discodermolide is one of the most promising products discovered to date and it is made synthetically. It is more potent than Taxol®. Improved analogs of discodermolide are currently under development. *Discodermia disoluta* is a deep-sea sponge (140 m).
Dictyostatin-1	*Spongia* sp. and Lithistid sponge (sponge)- from Maldives and Jamaica, respectively	Anticancer	Preclinical	Dictyostatin-1 was first isolated from a species of *Spongia* in trace quantities. Later it was extracted from a deep-sea sponge (442 m) of the order Lithistida. Experiments to develop a synthetic version of this compound are currently underway.
Dolastatin 10	*Dolabella auricularia* (mollusk)-Indian Ocean	Anticancer	Discovered by Arizona State University (USA) and developed by the National Cancer Institute (USA), Clinical Trial- Phase II.	This mollusk is the source of more than 15 cytotoxic peptides, the dolastatins. Most active of these is dolastatin 10, which has been chemically synthesized. Some dolastatins can also be isolated from cyanobacterium (*Symploca* sp.). In the 1990s large collections of the mollusk were made (i.e., 1,600 kg) and the project was criticized as an assault on biodiversity conservation.

Table 1 Selected marine natural compounds currently under development as drugs (Compiled from Fenical 2006, Maxwell 2005, Kijjoa and Sawangwong 2004, Proksch et al 2002 and 2003, Haefner 2003, and Faulkner 2000) (continued)

Compound	Source	Therapeutic area	Organization and development phase	Comments
Ecteinascidin 743 or ET-743 also known as Yondelis®	*Ecteinascidia turbinata* (tunicate)-Caribbean	Anticancer	Discovered by University of Illinois (USA) and developed by PharmaMar (Spain). Licensed to Ortho Biotec, Clinical Trial-Phase III.	This is one of the most advanced and promising compounds. Its total synthesis was achieved but it may be not economically feasible due to the low yields of the product. PharmaMar is growing *E. turginata* in an aquaculture facility, but researchers have to harvest over 1 ton of this organism to produce 1 gram of ecteinascidin.
ES-285	*Mactromeris polynyma* (mollusk)-Arctic Region	Anticancer	Discovered by University of Illinois (USA) and developed by PharmaMar (Spain), Clinical Trial-Phase I.	This compound is currently being synthesized in lab conditions.
E7389	*Halichondria okadai,*(Japan) also present in *Axinella* sp., and *Lissodendoryx* sp. (sponge), New Zealand	Anticancer	Developed by Eisai Medical Research Inc. (Japan), Clinical Trial-Phase II.	E7389 is a synthetic analogue of Halichondrin B, which is is the natural compound isolated from *H. okadai.*
GTS-21	Amphiporus lactifloreus (nemertine)-Japan	Alzheimer/ Schizophrenia	Discovered by University of Florida (USA) and developed by Taiho Pharmaceutical Co. (Japan), Clinical Trial-Phase II.	This compound is currently being synthesized in lab conditions.
HTI-286	*Auletta* sp. and *Siphonochalina* spp.(sponge)- Papua New Guinea	Anticancer	Developed by University of British Columbia (Canada) and Wyeth (Spain), Clinical Trial-Phases I and II.	HTI-286 is a synthetic analog of the tripeptide hemiasterlin isolated from these organisms.
ILX-651 (Synthatodin)	Synthetic derivative of Dolastatin 15 (*see* Dolastatin 10 and TZT-1027)	Anticancer	Discovered by Arizona State University (USA), developed by BASF Pharma and licensed to Genzyme Oncology (USA), Clinical Trial-Phase II.	The structural simplicity of this compound makes total synthesis a more viable option for supplying clinical trials than microbial culture (i.e., from cyanobacterias).
IPL-576,092	*Petrosia contignata* (sponge)-Papua New Guinea	Anti-inflamatory, oral asthma therapy	Developed by Inflazyme Pharmaceuticals (Canada), Clinical Trial-Phase II.	Contignasterol synthetic analogue, steroid. Chemical synthesis.
Kahalalide F	*Elysia rufescens* (mollusk) and *Bryopsis* (algae)-Hawaii, USA	Anticancer	Discovered by the University of Hawaii (USA) and developed by PharmaMar (Spain), Clinical Trial-Phase II.	This compound is being produced by chemical synthesis.
KRN7000 also known as a-GalCer	Agelas mauritianus (sponge)-Okinawa, Japan	Anticancer	Discovered by the University of Ryukyus (Japan) and developed by Kirin Brewery (Japan), Clinical Trial-Phase II	KRN7000 is a purified synthetic version of alpha-Galactosyl-ceramide which is the compound originally isolated from *A. mauritianus.*
LAF-389	*Jaspis cf. coriacea* (sponge)	Anticancer	Discovered by Tel Aviv University (Israel) and developed by Novartis (USA), Clinical Trial-Phase II.	This compound is being produced by chemical synthesis.

Table 1 Selected marine natural compounds currently under development as drugs (Compiled from Fenical 2006, Maxwell 2005, Kijjoa and Sawangwong 2004, Proksch et al 2002 and 2003, Haefner 2003, and Faulkner 2000) (continued)

Compound	Source	Therapeutic area	Organization and development phase	Comments
LY355703 (Cryptophycin 52)	*Nostoc* sp. (cyanobacteria also known as Blue Green Algae)	Anticancer	Discovered by the University of Hawaii (USA) and developed by Eli Lilly Research laboratories (USA), Clinical Trial-Phase II.	This is a synthetic analogue of the compound Cryptophycin, which is a cyanobacterial metabolite that was originally described as an anti-fungal compound, and later shown to possess anticancer properties.
Neovastat (AE-941)	Squalidae (fish)	Anticancer	Developed by Aeterna Zentaris (Canada), Clinical Phase III.	This compound is a natural extract extracted from cartilage of different shark species.
OAS-100	*Pseudopterogorgia elizabethae* (coral)-The Bahamas	Anti-inflammatory	Developed by OsteoArthritis Sciences Inc. (USA), Clinical Trial-Phases I and II.	This compound is a semisynthetic derivative of pseudopterisone A.
PM02734	Derivative of the Kahalalide family (*see* Kahalalide F)	Anticancer	Developed by PharmaMar (Spain). Clinical Trial - Phase I.	This compound is a new depsipeptide produced synthetically.
Salinosporamide A	*Salinospora tropica* (bacterium)	Anticancer	Developed by Nereus Pharmaceuticals (USA), Preclinical-Phase I.	This is a deep sea bacterium (1000 m). Species of genus *Salinospora* produce a great variety of other novel molecules.
Sarcodictyin/ Eleutherobin related compounds	*Sacordictyon roseum* (coral)-Mediterranean region	Anticancer	Developed by Scripps Institution of Oceanography (USA) , Preclinical.	Toxicity similar to Taxol. In the late 1990s, Eleutherobin underwent preclinical trials at Bristol-Myers Squibb but is no longer being pursued due to the difficulty in obtaining sufficient material.
Squalamine Lactate or MSI-1256F	*Squalus acanthias* (shark)	Anticancer	Developed by Genaera Corporation (USA), Clinical Trial-Phase II.	This compound is produced through chemical synthesis.
Thiocoraline	*Micromonospora marina* (marine actinomycete)	Anticancer	Developed by PharmaMar (Spain), Preclinical.	Preclinical studies suggest that melanoma and breast and non-small cell lung cancer cells are especially sensitive to the compound thiocoraline. Efforts to develop thiocoraline are currently focused on dosing schedule and delivery optimization.
Topsentin	*Spongosporites ruetzleri* (sponge)	Anti-inflammatory	Discovered by Harbor Branch Oceanographic Institution (USA), Preclinical.	Deep sea sponge (300-600 m.)
TZT-1027 (Auristatin PE or Soblidotin)	Synthetic Dolastatin (*see* Dolastatin 10, Cematodin and ILX-651)	Anticancer	Clinical Trial-Phase II.	The structural simplicity of this compound makes total synthesis a more viable option for supplying clinical trials than microbial culture (i.e., from cyanobacterias).
Variolins	Compounds originally discovered in the sponge *Kirkpatrickia variolosa*.	Anticancer	Developed by PharmaMar (Spain), Preclinical.	Encouraging preclinical results have been demonstrated against a panel of human leukaemic, ovarian, and colon carcinoma cell lines, and multi-drug resistant cell lines, at very low concentrations.
Zalypsis® (PM00104)	Synthetic Safracin B derivative.	Anticancer	Developed by PharmaMar (Spain), Clinical Trial-Phase I.	Relatively new synthetic alkaloid (2006) based on a Saframycin molecule and related to the chemical compounds Jorumycina and Renieramicinas derived from mollusks and sponges.

Table 1 Selected marine natural compounds currently under development as drugs (Compiled from Fenical 2006, Maxwell 2005, Kijjoa and Sawangwong 2004, Proksch et al 2002 and 2003, Haefner 2003, and Faulkner 2000) (continued)

Compound	Source	Therapeutic area	Organization and development phase	Comments
Ziconotide, Prialt®	*Conus magus* (mollusk)	Analgesic (neuro-pharmacologic activity)	Discovered by University of Utah (USA) and developed by Elan Pharmaceuticals (Ireland). The European Union and the USA Food and Drug Drug Administration approved Ziconotide for the treatment of severe chronic pain in February 2005 and January 2004, respectively.	Chemists working for compound licen*see* Neurex, Inc. (since acquired by Elan Corporation) synthesized more than 200 ziconotide variants, but eventually decided that the original marine-derived structure (identical to their synthetic analog MVIIA) exhibited the most desirable bioactivity.

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5 Research Collaborative Agreements and Bioprospecting in Costa Rica: Scientific, Technological and Legal Impacts

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There are several questions that have been consistently raised after the first research collaborative agreement (RCA) was signed between Merck & Co., Inc. and the Instituto Nacional de Biodiversidad (INBio, National Institute of Biodiversity of Costa Rica) in 1991. While that is not the only RCA that has been signed with an industrial partner, most of the terms and conditions negotiated in that agreement provided a baseline for other RCAs and for the structure of the Convention on Biological Diversity (CBD) in 1992 (Sittenfeld and Gámez 1993, Sittenfeld and Lovejoy 1998, Tamayo *et al.* 2004). After 16 years of INBio experience, impacts can be assessed from a number of standpoints: scientific, social, technological, legal, economic, and of course, from the viewpoint of conservation. The intent in this chapter is to focus on the scientific, technological, and legal impacts associated with the bioprospecting agreements negotiated, since the other issues mentioned have been discussed extensively in other publications (Mateo 1998, Mateo *et al.* 2001, Guevara 2003).

Since its inception, INBio has recognized the need to build strong ties with the academic sector, both national and international, in order to strengthen the scientific component of its activities. In this regard, INBio has signed cooperative agreements with major public and private universities in Costa Rica and abroad. The international academic dimension has been considered a key aspect and therefore a network of collaborators has been nurtured, expanded, and consolidated over the years. At the organizational level, INBio's Assembly of Founders includes highly accomplished scientists and other outstanding professionals and members of civil society. The Assembly, along with two international advisory boards shape and monitor the path of the Institute.

As in other aspects of life, the first experience in this particular case, the first negotiation process, was difficult since INBio was building its scientific core from the ground up and shaping its strategy. The authors' object in this chapter is to put into perspective the initial conditions that prevailed and how they influenced the scientific and technological development within INBio-Bioprospecting, as well as how they influenced the final legal framework that Costa Rica has created and adopted.

5.1 Overview of INBio's bioprospecting approach and its technologies

5.1.1 INBio's philosophy

The protection of natural resources in Costa Rica dates back to the first years of Costa Rica's independent life as a nation (1828) and was strengthened from 1970 to 1990 when the greatest number of protected areas was created. The country established an ample legal framework that translates into more than 300 laws and decrees that regulate the management of biodiversity and cover a wide array of topics both socioeconomic and cultural, as well as scientific-technical and managerial. These guidelines are of national, regional, and international scope (Obando 2002).

Nevertheless, the conservation 'way of life' was initially adopted by Costa Ricans as an effort for preservation; hence, the idea was to maintain the protected ecosystems untouched and unveiled. It was from 1988 onward that the first steps toward a strategy of *Save-Know-Use* (Figure 1) were taken, resulting in legal and institutional changes (Ugalde and García 2003). The country concluded that 'they had to seek the opening of the wild areas to a population that would also see in them something that belonged to them, something very valuable and worth taking care of, an appropriate place

for intellectual and spiritual recreation, from which, economic benefits can be derived without inflicting harm on the biological resources. In this way, the old philosophy, the philosophy of custody, should give way to another one, one of sustainable use of biodiversity resources.' (Gámez 1999).

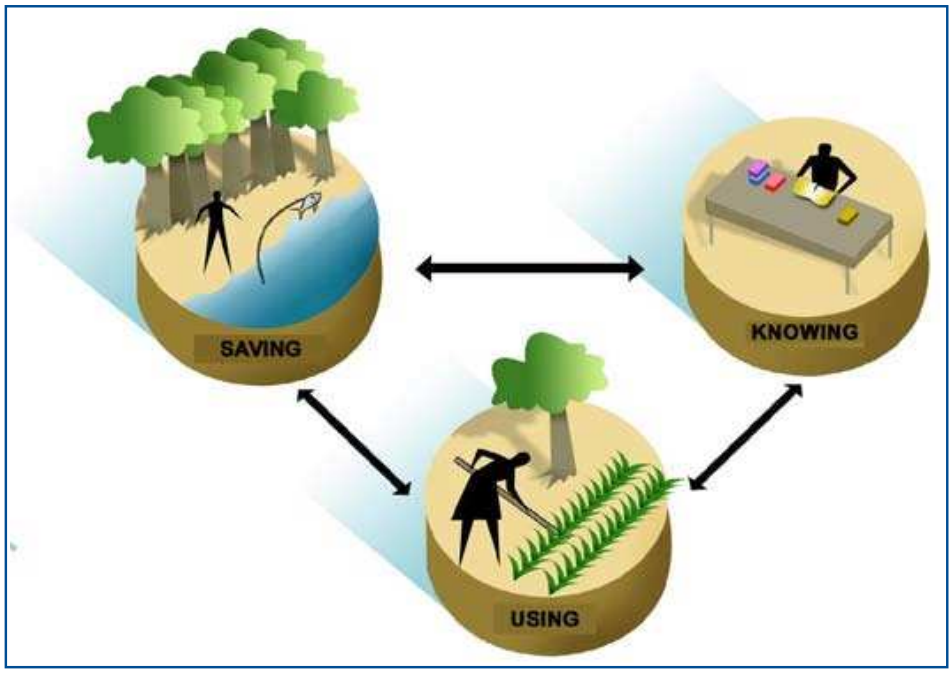
As part of the institutional and ideological changes that took place in the country, INBio was founded in 1989. INBio was created by recommendation of a governmental commission that considered the need for the creation of a new organization that had as its priority the generation of knowledge of the biological diversity of the country and the promotion of its nondestructive and sustainable use (Matamoros and García 2000).

The vision of INBio – from the first year of its creation – touched on 'an organization that, focused on the management of information, began the process of knowledge generation based on field activity and the inventory laboratory to then curate and process the information in a variety of ways and to finally disseminate it to two types of customers: those of an economic nature and those of an intellectual nature' (Gámez 1991). The evolutionary process of INBio and all the activities developed since its inception, have clearly demonstrated that its philosophy has centered on the elements of the strategy for conservation of biodiversity (Watson *et al.* 1995): *Save-Know-Use,* illustrated in Figure 1.

Approximately 25% of the Costa Rican territory falls into a given protection category and conservation areas are managed by the National System of Conservation Areas (SINAC, its acronym in Spanish), a governmental unit under the Ministry of the Environment and Energy (MINAE). INBio works closely with SINAC and MINAE and it has contributed to the conservation initiatives of the country (*Save*) with information, knowledge, and to a certain extent, with resources. In particular, the information regarding species and ecosystems has been essential for decision making related to conservation. Additionally, INBio has been a reference organization and source of constant support to the Costa Rican government, providing not only answers to queries for decision making, but also being a driving force and facilitator of processes of great national importance as, for example, the development of the National Strategy for Conservation of Biodiversity.

In terms of knowledge generation (*Know*), INBio has dedicated and continues to dedicate the largest part of its activities to the generation, systematization, and dissemination of information and knowledge about Costa Rican species and ecosystems. The collections that INBio has are very important in terms of their size and how representative they are with more than 3 million specimens. It is also the only institution that has all of its collections systematized in a database (known as 'Atta'), which was developed specifically for the management of

Figure 1 Save-Know-Use



the species inventory information (Obando 2002). The advancement in the discovery of new species has been thanks to the support of a network of international taxonomists who contribute their expertise *ad honorem* for the identification of species, many of which are new for science.

INBio has translated the *Use* component into a number of important applications. The systematization of information and knowledge has been performed in different formats, useful to diverse target audiences, which range from elementary school students to policy makers and highly specialized scientists. This has allowed INBio to offer different product categories, from games and electronic documents for children to scientific books and interactive exhibits in the INBioparque, which is really the use of biodiversity for educational purposes and awareness of the value. In the same way, the knowledge generated by INBio has been used for the interpretation of trails for private and public protected areas and to support touristic developments.

In terms of bioprospecting or the systematic search for genetic and biochemical resources with application in a myriad of areas such as pharmaceutical or biotechnological industry, INBio continues to establish alliances with the academic and high-tech industrial sector. In these alliances, the key elements or criteria for controlled access, compensation, training, and technology transfer are upheld. These elements are integral today in the CBD and the Biodiversity Law of Costa Rica (No. 7788, 30 April 1998) and they were the basis for the negotiation with Merck & Co., Inc. back in 1991 (Tamayo *et al.* 2004).

With an enriching growth process throughout the 16 years since its foundation, INBio has evolved towards a strengthened mission: 'to promote a greater awareness of the value of biodiversity to achieve its conservation and to improve the quality of life of people', whereby the decision was made that the information to be generated must truly have an impact on conservation and development (Ugalde and García 2003). INBio, as a young organization, has changed dynamically over the past years, yet its goal is achieved by constant work in five areas of action: inventory and monitoring, conservation, communication and education, biodiversity informatics, and bioprospecting.

5.1.2 Overview of INBio's technological evolution

INBio-Bioprospecting favors those agreements in which there is significant value added in the process, that is, significant work to be carried out in Costa Rica. Therefore INBio has built a solid platform in terms of infrastructure and human resources, which, along with its solid and long-lasting alliances at the national and international levels, enable it to offer technological advantages over other possible competitors. Three main technological processes make INBio an innovative, efficient, and attractive organization: inventorying, biodiversity informatics, and bioprospecting. The first two evolved mainly at the same time generating a combined technological development, while the latter required more tailor-made projects and therefore, its technology and scientific priorities change over time.

5.1.2.1 The technological development of the inventorying and biodiversity informatics processes

INBio's main activities began with the inventory process. There, it has emphasized technologies centered on gathering information and keeping it safe (*inventorying* and *biodiversity informatics*). As with most developments within INBio, these two processes require the active participation of collaborators. The current level of knowledge of Costa Rican biological diversity would not have been possible without the support of international specialists who have found in INBio and Costa Rica a laboratory for the discovery of new species. 'To have been able to accomplish a number of alliances has been an important success factor for the institution' (Gámez 1999). With the support of national and foreign specialists, it has been possible to generate information on ecosystems which together with the species, make up an important source of data, useful for conservation purposes and the sustainable use of the elements of biodiversity.

The inventory process was biased initially towards plants and arthropods. Mammals, other vertebrates, marine invertebrates, and microorganisms were not included at first, either because they were already fairly well known, as was the case for mammals, or because

the institution lacked taxonomists or experts on those particular organisms, as was the case for microorganisms. In more recent years, large groups such as fungi have also been incorporated, and the work has included some initial efforts on molecular taxonomy of selected microorganisms.

It is important to emphasize that INBio's resources were very limited at the beginning and hence its informatics platform was limited to personal computers. All data related to collections, taxonomic identification and distribution were kept on personal databases, which were supported on commercial software and created either for Mac (most arthropods) or PC (plants) environments. The need to have a reliable, unified, and robust process for storing data was evident. The most important contribution of INBio to the national inventorying process was to create a systematic platform for gathering information, which incorporated barcoding technology to tag and track specimens, an interactive *parataxonomist-curator-taxonomy experts core* and the first biodiversity inventory management data system (BIMS) to keep records of collections. This updated strategy clearly begins with the definition of taxonomic groups, categorized by organisms to be studied.

The implementation of the process took around five years to be fully operational and benefited from the Intergraph-INBio Research Collaborative Agreement (RCA) in 1994. The BIMS, originally programmed in a tight informatics software was migrated to a more robust and user-friendly system, called Atta (http://atta.inbio.ac.cr/attaing). This is the information system that facilitates the processes of capturing, managing, generating, and disseminating information on Costa Rican biodiversity. The system maintains a relational Oracle® database with over three million records (as of 2005), and also includes interfaces to export information to standard tools such as ArcView® and MS-Excel®. The design and implementation of Atta took several years and it became a powerful and recognized tool for information retrieval at the species and specimen levels for each collection made by the Institute. The development of this system was recognized with the 2003 Environment Award given by the Tech Museum of Innovation (San Jose, CA USA), which honors innovators from around the world (http://techawards.thetech.org/laureates).

5.1.2.2 The technological development of the bioprospecting process

Upon INBio's creation in 1989, it was clear that the development of the *Use* component from the general strategy would follow, but it was not until 1991 that bioprospecting activities actually began, thanks to a grant given by the John D. and Catherine T. MacArthur Foundation to Prof. Thomas Eisner at Cornell University, Ithaca, NY USA. The grant provided the basis for the first research collaborative agreement with an academic institution and the aims were to develop and execute the strategy for chemical prospecting.

The initial criterion was based on building alliances with Costa Rican institutions and research groups – still used today with different scopes – which enabled INBio to have the first chemical prospecting projects allocated within main public national universities. INBio wanted to avoid duplication of efforts and recognized the excellence of the Costa Rican academic research groups and therefore acted as a catalyst. While the results of such an endeavor were limited in terms of products and publications, it allowed INBio to align research groups toward a common goal which benefited from the infrastructure and knowledge that were beginning to be developed.

Nevertheless, with the 1991 Merck-INBio RCA it became clear that some infrastructure had to be in place within INBio. Hence resources to be able to collect, catalogue, prepare samples for extraction, and conduct taxonomic studies on collected material were set up at INBio. With time, the infrastructure grew to include extraction and fractionation for chemical prospecting, and since 1997, the laboratory expanded to include resources for biotechnological and gene prospecting.

INBio has signed more than thirty agreements with both academia and industry, and each agreement is different from the others. From the technological standpoint, each agreement requires that different capabilities be available within INBio. Therefore, laboratories and human resources have to be highly flexible and versatile.

Currently, the Bioprospecting Strategic Action Unit covers more than 1,100 square meters equipped with the following resources and capabilities:

- *Plant Biotechnology Laboratory*: built with the col-

laboration of Phytera Inc., this resource includes the means for sterilization, preparation of media, and transference and culture rooms, where micropropagation of plant species takes place.

- *Molecular Biology Laboratory*: set up at first as part of a collaboration with Diversa Corporation and supplemented with support from other projects, it includes resources to perform DNA extraction, quality control of DNA, and PCR (polymerase chain reaction).

- *Microbiology Laboratory*: initially supported by an International Cooperative Biodiversity Groups (ICBG) initiative, activities such as isolation of cultured bacteria and basic bactericide and bacteriostatic assays can be performed. This resource was used recently to perform general biochemistry experiments on bacteria and isolation of actinomycetes.

- *Mycology Laboratory*: built in alliance with the inventorying process and a World Bank Global Environmental Facility project, this resource was also set up in collaboration with Merck & Co, Inc. It currently possesses the most comprehensive infrastructure, since collection, isolation, preservation, culturing, and preliminary taxonomic determination takes place here.

- *Chemical Laboratory*: several projects have contributed to set up this resource. It is divided into extraction, preparative fractionation (BioXplore© Technology, which will be explained later on), semi-analytical fractionation, and chemical analysis areas. The infrastructure is complemented with a nuclear magnetic resonance facility that was set up jointly with the School of Chemistry of the University of Costa Rica, thanks to a donation from the Costa Rica-United States of America Foundation for Cooperation (CR-USA).

- *Preparation of samples*: equipped with a larger freezer room, grinder mill, ovens and freeze dryers, this resource was set up at the beginning to accommodate plant samples and later expanded to include all kinds of samples collected on the wild. Vouchers are not included in this facility but are placed within the Botany & Arthropod Strategic Action Units.

- *Bioprospecting Informatics:* one independent server allocates several databases that are tailor-made according to each research collaborative agreement and also houses the human-interface software for the BioXplore© Technology.

These resources were set up with significant technology transfer and training from collaborators. In terms of infrastructure, the Bioprospecting Strategic Action Unit is a very flexible and versatile resource, built with an investment of more than US$2 million to date gathered from different sources, where microbiologists, biologists, forestry engineers, agronomists, chemists, biotechnologists, mycologists, business administrators, and molecular biologists are dedicated to adding value to Costa Rican genetic and biochemical resources. The Unit is divided into three main areas under the coordination of a General Manager: administrative, scientific, and business development.

Most of the past and ongoing projects are focused on chemical and biotechnological prospecting therefore the infrastructure that INBio has built in the past years is concentrated on these two areas. While the first relates to the search for small molecules with innovative uses (for example, as antibiotics, pesticides, new fragrances, etc.), the second deals with the search of DNA sequences, genes, or whole organisms with general applications in the biotechnological area. Given the nature of the collaborations, it is highly likely that the infrastructure will either grow or change with time, according to the project needs.

5.1.2.3 The impact of inventorying and biodiversity information on the bioprospecting process

The impact that the inventorying process and the development of information systems have had on bioprospecting is important particularly in the negotiation process and in those projects where taxonomy has to be assessed. Some proposals need, beforehand, a list of possible species and information on distribution and natural history. In this regard, the bioprospecting process has the geographical advantage of sharing the same infrastructure with the inventorying process, but the information on taxonomy and distribution is usually the same as the one that any other researcher from any part of the world could access through the internet.

Naturally when taxonomy is known, there is already a high added value implicit in the negotiation. The fact that more than 90% of the Costa Rican plants are known provides an interesting negotiation tool with both advantages and disadvantages:

- Data mining with names of plants was done already in the early 1990s, and extensively searched plants could be excluded for a research project that sought novelties. Databases that were accessible under usual industrial standards included NAPRALERT (Natural Products Alert Database, implemented by the University of Illinois at Chicago), the commercial database Dictionary of Natural Products (Buckingham 2006), and finally, electronic searches using Dialog or STN International (Scientific and Technical International Network, Karlsruhe, Germany). Now through the web, more comprehensive tools, such as the Institute of Scientific Information Web of Knowledge (UK) or other abstract services, provide enough information to evaluate if a given plant species has been fairly investigated.

- On the other hand, botanical gardens abroad do have extensive representations of the Mesoamerican flora in their greenhouses and some of them have made plant materials available for bioprospecting purposes without establishing an RCA and/or without any compensation to the country of origin.

Such is not the case for less known and poorly understood organisms, such as insects and microorganisms in general, although from the first group there is significant knowledge that has been generated by INBio. Even if taxonomy is not known, INBio gathers data on the ecosystems where they are found and builds complementary and valuable information.

It is important to recognize that taxonomic efforts are very expensive and are usually excluded in projects, at least at early stages. For bioprospecting purposes, an organism should be identified only when it has been assessed as having some potential. If one recalls that there are 360,000 expected species of insects in Costa Rica to be found, and less than 20% of those have been taxonomically described, conducting bioprospecting-based research on insect taxonomy would require too much effort and funding and most industries or organizations would not support such activities. In this regard, natural history and ecosystem information seems to be of more assistance. The same is also true for microorganisms, although, in contrast to other organisms, microorganisms present distinct features: if the organism can be cultured, and it is accessible, there would not be any dependence on the original source – no 're-supply' issue (*see* below). On the other hand, if the organism cannot be cultured, its DNA could be obtained and, once accessible, genomic libraries could also be built from it without any dependence on the original source.

One related aspect is that the negotiation of projects based on microorganisms usually begins with two misleading questions: *What do you have in your collections*? followed by: *Could you guarantee that you would not work with the same species with other partners*? While the first question tries to add a monetary and intellectual value to the collection, the second one deals with another important issue, which is exclusivity. It is hard to estimate the potential of a collection in terms of its diversity, without knowing the taxonomy of species included in it, and without conducting any effort to estimate the redundancy of the collection. Therefore, the real value of live and limited culture collections is questionable and they compete with larger collections, such as the American Type Culture Collection (http://www.atcc.org/About/AboutATCC.cfm) with about 18,000 bacterial and over 27,000 filamentous fungi and yeast strains; the German Collection of Microorganisms and Cell Cultures (Deutsche Sammlung von Mikroorganismen und Zellkulturen, http://www.dsmz.de/) with over 14,000 strains; the Japan Collection of Microorganisms (http://www.jcm.riken.go.jp/JCM/aboutJCM.html) with over 12,000 strains; and the British National Collections of Industrial, Food, and Marine Bacteria (http://www.ncimb.com/html/culture_collection.php) with over 7,000 bacterial strains. Mergers and acquisitions bring an additional challenge as well, since large private collections have been built within industries and they constitute an asset in the negotiation process.

INBio has established a small facility as a culture depository of fungal and bacterial strains, although the decision to build it took several years. The current strategy focuses on delivery of extracts not of live material. Therefore, live specimens are kept following different protocols and an RCA is structured under the premise that INBio could re-supply more material once a promising activity is discovered.

It is hard for synthetic or combinatorial chemists to deny the potential of natural products as sources of valuable compounds with therapeutical applications. Natural products offer a myriad of chemical scaffolds hard to find in synthetic approaches, yet most recently the development of high-throughput screening systems and related technologies makes it easier to test millions of synthetic compounds instead. There are some minor undesirable characteristics exhibited by natural products that favor the use of combinatorial chemicals, although the former are usually more successful. One of these characteristics is the so called re-supply issue. On one hand, biodiversity-rich countries offering access to their genetic resources will desire to keep control on their genetic arsenal and, on the other, pharmaceutical industries need to be certain of securing more material when there is a lead to follow up. In INBio's experience, re-supplying material is an indication of research development and should not be hindered; on the contrary, it must be defined and recognized when agreeing on the RCA terms. In most cases the final product is a semi-synthetic compound or derivative from the original one, and therefore, the resupplied material is used basically in its development and is usually needed in fair quantities. Most industries fear that there would not be a commitment to offer reproducible conditions (same geographical collecting site, same extracting methodology, etc.), and therefore avoid the inclusion of natural products in their drug-discovery programs. In this regard, INBio has been successful in re-supplying material when needed.

If a semi-synthetic or derivative is the final product, identification of the target source is important only for scientific purposes and therefore taxonomical efforts are usually on the sidelines. RCAs cover intermediate and final products, independently of the source of the materials and the identification of those materials is important to avoid redundancies. But if the natural product itself is the one to be developed, then the taxonomical identification of the producing species becomes important as the source of such materials. It has been argued that current technologies will allow the taxonomical identification of an extract source – *chemotaxonomy approach* – and hence to offer 'blind' coded extracts is highly naïve. These technologies have been developed to avoid redundancies, known as the *dereplication process*. A significant proportion of naturally occurring compounds are widely distributed among species, that is, they are always found in raw extracts and most recent reports indicate the presence of same or related compounds in plants and endophytic symbionts for example (Puri *et al.* 2005). The *chemotaxonomy approach* is useful only when desired chemical characteristics are needed and it is rather naïve to think that industries are generating technologies to unveil the genetic source, while what they are developing are technologies for chemical identification and avoidance of redundancies. Taxonomical capabilities are important for the biodiversity-rich partner instead who has to demonstrate that it is highly efficient in re-supplying materials in a reproducible and reliable manner. Collaborations that include DNA and live samples must be carefully evaluated. They do not present the re-supply issue, since the sample itself is sufficient to provide endless quantities of expressed substances. In this regard, follow-up tools and reports must be addressed in the RCA.

Human resources for collecting and curation of materials differ between the Bioprospecting and the Inventory strategic units and the information obtained from bioprospecting activities is not uploaded to the institutional database. Most donors of the inventory work expressed concerns of benefiting private enterprises if both processes got mixed up and they were separated from the beginning. There are four important implications arising from this executive decision. First, manpower is somewhat duplicated – for example, parataxonomists who collect for the inventorying process, do not collect for bioprospecting. Second, database development evolved at different speeds. Third, tough negotiations have to be made, since most companies wrongly believe that they could benefit from an existing platform without substantial financial support. Finally, as a result of all the above, bioprospecting at INBio was consolidated as a self-sustained initiative and was conceived as a highly flexible and versatile unit. Nevertheless the existing platform of the inventorying process – even from the beginning – and its data management were needed in the scientific and negotiation processes, depending upon the targeted organism.

Independent of the type of collaboration signed, the tracking of samples and extracts has always been in the bioprospecting agenda. Therefore, the Unit has structured its own systems to follow up on samples, and their development has been independent from that of BIMS and Atta. Upon collection of a sample, it is given an INBio code number that will identify the sample throughout every further step. This may include, for example,

drying, grinding, extracting, and pre-fractionation. This code is basically used for internal use and traceability purposes. When a sample is ready to be delivered to a research partner, it is given a unique bar code number and labeled accordingly. When a partner needs re-supply or complementary information, it has to provide the bar code number and all associated information will be extracted from the databases. This system has proven to be reliable and associated information can easily be obtained. Improvements such as web access to selected information are the next development steps. Most likely, the first to benefit from such infrastructure will be academic partners.

5.1.3 Overview of inactive bioprospecting projects

Since 1991, bioprospecting RCAs have addressed some key elements: projects have to deal with nondestructive uses of biodiversity, access to biodiversity has to be controlled so there is a limit on the quantity of material being collected and the number of site visits for collection purposes, industrial partners have to contribute to conservation through an up-front payment which can be up to 10% of the negotiated research budget, technology transfer in the form of protocols or equipment which are essential to undertake the research activities are factored into the project, training of national scientists (either through on-site training in Costa Rica or abroad) takes place, and compensation provisions through both research budgets and equitable benefit-sharing mechanisms are established.

INBio has executed a number of projects through RCAs. Some of them are on going ('active') and others have concluded ('inactive'). Before turning to a more specific discussion of active RCAs, we first briefly summarize the status of inactive ones. RCAs typically are made up of the body of the agreement with all the contractual, administrative, and regulatory specifications and annexes including among other things, the work plan and budget. The RCA includes an effective date, the research period, and the agreement term and stipulates the articles and obligations that would survive any expiration or termination.

Our criterion to catalogue a project as 'inactive' shall be that the research activities – under the RCA – that INBio was to perform in accordance with the agreed work plan have ended. Furthermore, renewals of specific RCAs were considered as individual data points when enumerating inactive projects. INBio has 22 inactive projects as of 30 June 2005 (Table 1): 16 were of a chemical prospecting nature and six were of a biotechnological prospecting character. The fact that projects are inactive does not mean that obligations for compensation, intellectual property rights, reports, etc. have terminated. These provisions typically survive beyond the expiration of the project activities to be carried out specifically by INBio.

Table 1: Inactive INBio-Bioprospecting Projects (as of 30 June 2005)*

Project name	Number of agreements (including renewals)	Project partner
Chemical prospecting		
Search for sustainable uses for Costa Rican biodiversity	4	Merck & Co., Inc., Whitehouse Station, NJ USA
Supply and application of DMDP (2,5-didydroxymethyl-3,4-dihydroxypyrrolidine)	1	British Technology Group (BTG), London, UK
Chemical prospecting in a conservation area in Costa Rica	1	Bristol-Myers Squibb Company (BMS), Wallingford, CT USA and Cornell University, Ithaca, NY USA
Fragrances and aromas	2	Givaudan Roure, NJ USA
Insecticidal components	1	University of Massachusetts, Boston, MA USA
Development of a natural nematicide – Tropical program for assessment of the efficacy of DMDP	1	Empresas Ecos S.A.–La Pacífica, San José, and Guanacaste, Costa Rica

Project name	Number of agreements (including renewals)	Project partner
Search for compounds with antibacterial and antiviral properties from plants	2	Indena S.p.A., Milan, Italy
Human health	1	Strathclyde University, Stathclyde, Scotland
Search for novel compounds from plants	1	Eli Lilly & Co., Indianapolis, IN USA
Search for antiparasitic activity from plants	1	Swiss Tropical Institute, Basel, Switzerland
Potential drugs from poorly understood Costa Rican biota	1	Institute of Chemistry and Cell Biology, Harvard Medical School, Boston, MA USA
Biotechnological prospecting		
Search for enzymes from extremophilic organisms	1	Recombinant BioCatalysis, Inc., San Diego, CA USA
Gene prospecting – Phase I	1	Diversa Corporation, San Diego, CA USA
Gene prospecting with potential nematicidal activity	1	Akkadix Corporation, La Jolla, CA USA
Search for compounds with biological activity in tissue culture from Costa Rican flora	1	Phytera, Inc., Worcester, MA USA
Development of protocols of microorganisms with potential for biological control	1	Compañía Agrícola La Gavilana Ltda., San José, Costa Rica
Development of micropropagation protocols for plants as potential ornamentals	1	Agrobiot S.A., Alajuela, Costa Rica

* This table focuses only on research collaborative agreements; hence, material transfer agreements, service contracts, and other types of agreements and projects are excluded from its scope.

In 1991, with the first RCA, INBio had neither the expertise nor the required infrastructure (lab space, equipment) to carry out chemical prospecting processes. However, it did have 4% of the world's biodiversity, inventory and natural history information, knowledgeable people willing to rise up to the challenge, and a corporate partner that accepted the key elements mentioned in the beginning and that wanted to invest in natural products. The bioprospecting agreement offered infrastructure and equipment investments at the University of Costa Rica, training, and up-front fees for conservation and compensation; protected areas also benefited.

From the beginning, the strategy of INBio has been to add as much value as it can 'in country' and to build and strengthen technological and scientific capabilities based on the demands and needs of its academic and industrial partners, both national and international. It is understandable that the first project in plant chemical prospecting required significant investment and that INBio could add lesser value then than it can today after more than a decade of expertise. The Institute also relies on interactions between different disciplines, such as molecular biology, microbiology, plant biotechnology, and mycology to have an integral scientific approach to problem solving.

Throughout the years, and in spite of INBio having to build its capabilities from the bottom up, aspects such as access to biodiversity, preliminary data, strategic alliances, ability to innovate, respond quickly, and carry out quality work remain critical issues in any negotiation. Scientific capabilities have been nurtured during these years and technology has played a major role in negotiation as well. It is difficult to imagine today a negotiation without such basic tools as internet access, e-mail, and conference calls. Despite the fact that nothing can replace face-to-face meetings, these tools have provided INBio with a means to explore potential opportunities, write grants and follow up on project activities in a timely and cost-effective manner.

A robust scientific basis for the project is essential in any negotiation. In this regard, trends in natural product research also impact project conception and prompt introspective reviews on the type of information that INBio should be generating to meet the demands of the projects and to continue to promote a greater awareness

of the value of biodiversity. The bioprospecting trend to shy away from macroorganisms, such as plants, and to focus on and explore uncommon microbes poses interesting questions related to inventory efforts. Sixteen out of the 22 inactive projects mentioned above have utilized inventory information in one way or another. However, it is understandable that from a microbial standpoint, and due largely to the costs involved, identifying bacteria and microfungi in an industrial setting could be justified from a cost/benefit perspective only once an exciting and promising lead natural product is identified. Advances in molecular taxonomy technologies and decreasing costs for sequencing have helped to identify microorganisms of interest. In the way that INBio advocates and undertakes bioprospecting activities, an inventory of microorganisms from different sites and at diverse times within the country is a very valuable asset to biodiversity and ecosystem knowledge in general; a tool for conservation. Hence, INBio negotiates the inclusion of molecular taxonomy efforts in its microbial projects.

5.1.4 Costa Rican political and legal context for the development of INBio

As mentioned before, Costa Rica has an adequate legal framework that enables it to regulate a number of diverse aspects related to the management of biodiversity. This situation, coupled with the pioneering experience in the establishment of scientific research collaboration agreements with industry and academia in the international scene, has provided INBio and the country comparative advantages in the negotiation of these agreements, when compared to other countries with equal or more biological wealth.

The favorable conditions to develop initiatives related to conservation, as well as the establishment of the National Strategy for Conservation and Sustainable Use (Obando *et al.* 2000), based on the principles of *Save-Know-Use*, has enabled an increase in the knowledge of the different values of biodiversity and how it – if conserved and used sustainably and intelligently – can contribute to improvement of the quality of life of Costa Rican society. The birth of INBio as an organization, supported in its conception and spirit by the Costa Rican government, and the permanent manifestation by the Institute of its position as a partner and ally of the National System of Conservation Areas has allowed the country to be the pioneer in terms of access and use of genetic and biochemical resources.

The term 'genetic resources' is defined for the first time in Costa Rican legislation in law No. 7416 (1994) which ratified the CBD. Notwithstanding anything in the foregoing, the sovereignty of the country over its genetic resources is enacted in the Wildlife Law No. 7317 of October 1992. In this law, wild fauna is considered public domain and wild flora is declared of public interest. Additionally, in Article 4 the 'production, extraction, commercialization, industrialization and use of genetic material of wild flora and fauna, its parts, products or sub products' are declared of public interest and national heritage.

In terms of access and use of resources, the Wildlife Law in article 36 stipulates that 'Costa Ricans and foreigners are authorized to exercise scientific and cultural collections of animals and plants, their products or sub products and to carry out research as long as it does not contravene the regulations of this law and its rules'. In the same way, Article 50 stipulates that 'any research and development activities that are carried out in order to obtain new varieties, hybrids, drugs or any other type of product that can be obtained from wild species, its parts, products or sub products, have to have the corresponding authorization from the General Head Office of Wildlife'. Before the Wildlife Law became effective and during the first years of its implementation, the steps for access to wild materials for research purposes involved a complex process, which differed according to the authority responsible for the custody of the diverse categories of wild areas under protection where the access would take place.

Since 1992, and towards the end of 2003, INBio executed its bioprospecting activities, backed by the Wildlife Law and having as an action framework the Agreement signed with MINAE, formerly the Ministry of Natural Resources. In this agreement, the interest of both parties to work jointly to generate knowledge about Costa Rican biodiversity, the interest of the government to support the activities of INBio, and the commitment of the Institute to comply with all the dispositions of the standing and enforced legislation were outlined – including the request of the needed permits by the government to access the biochemical and genetic elements and

resources present in the protected areas under SINAC management.

During all these years, INBio has requested over 70 permits for the execution of its research projects by the Bioprospecting Unit and even though in the beginning their attainment was not easy, with the passing years, a special process ('*Ventanilla única*') was created that facilitated all the procedures for granting permits for collection in State-protected areas. By means of *Ventanilla Única* up to December 2003 – the date the general guidelines for access and use of genetic and biochemical resources (in accordance with the 1998 Biodiversity Law) came into effect – all research permits that involved both the use of biological resources, as well as the use of genetic and biochemical resources, for basic research or bioprospecting were presented and granted by this office. The permits, up to this point, were granted in a period not exceeding 15 days and the information as well as the requested requirements were relatively straightforward to present. It is important to highlight that all projects, active and inactive, are and were carried out under the umbrella of a collection permit, which is renewed upon request depending upon the duration of the collaboration.

In the first and historic negotiation initiated in 1990, 'logic and adherence to justice and equity' reigned. From this point onward, INBio has chosen to continue to share with the government – in equal terms and when the collecting takes place in State-protected areas – the economic benefits that may arise with the aim to secure that the future benefits for the use of the biodiversity resources are allocated in their entirety to 'knowledge and conservation of biodiversity'. Also, a principle was established for the Institute to act as a partner in joint research collaboration projects and not as a mere provider or supplier of raw material. This is to say that, to any biological resource used, INBio adds value of information and processing, which is valued and recognized by the partner (Gámez 1999).

Other relevant considerations were also established which served as the basis for the enactment of specific legislation in the area of access and use of genetic and biochemical resources of the country, such as the 10% contribution from the research budget which is transferred directly to the protected wildlife areas of the State, a monetary compensation in the form of royalties from those products that reach the market, technology transfer, training for national researchers, equipment, and the required infrastructure to conduct the proposed investigation and to strengthen national capabilities. These considerations imposed by INBio and particularly the guidelines established in the Wildlife Law, were the framework that supported all the activities developed by INBio until the end of the year 2003.

The Biodiversity Law began to take shape in the year 1996, when different groups manifested the need to consolidate and to provide legal support to the national system of conservation areas and to establish specific guidelines for the access and use of genetic and biochemical elements of biodiversity in the context of the CBD. Before and after the CBD, Costa Rica defined the rules of the game for the development of bioprospecting projects and the majority of them are reflected today in the enforced Biodiversity Law. National and international institutions, which have signed RCAs with INBio, know and have accepted these rules.

The Biodiversity Law was approved in 1998 and it laid out the basic requirements for access, the requirement for prior informed consent (PIC), the terms for technology transfer and equitable distribution of benefits, and the way in which the activities would contribute to the conservation of species and ecosystems. The application of the Biodiversity Law in the area of access came into effect at the end of the year 2003, when the specific guidelines to regulate access and use of genetic and biochemical elements of Costa Rican biological diversity were approved. With the entry into effect of the Biodiversity Law and particularly the above-mentioned guidelines, the requirements for granting the access permits became a little more complicated. An obligation is established to generate a file for each permit, to complete an access request form and a technical guide with information on the project and the documentation of PIC, which is granted, in the case of areas under the jurisdiction of the State, by the conservation area directors, 11 in total.

As with the Wildlife Law, the implementation of the new guidelines has taken time and in one way or the other, research projects have suffered delays. At one point, the academic sectors even expressed their concern that these guidelines would become an obstacle for the scientific and technological development of the country. However, the implementation process has evolved

positively. INBio was the first organization to which a permit was granted under the new access guidelines and the first to establish a general framework agreement with the Technical Office of the National Commission of Management of Biodiversity (CONAGEBIO), in order to make procedures more agile. On another front, the Institute is discussing with SINAC the establishment of a unique procedure for the directors of the conservation areas to have a better response time for the requests of PIC coming from INBio. Until these procedures are optimized, the permits will not be secured in a period of less than two months, even though it might be a shorter time depending on the conservation area which has to grant the PIC. At this point the PIC is the most significant bottleneck in the process of securing an access permit.

But have these changes in the legislation pertaining to access and use of genetic and biochemical resources affected the negotiation of scientific collaboration agreements for bioprospecting? In all of the cases, the companies or organizations interested in working with INBio are apprised of the guidelines and the timeframe needed to obtain an access permit is explained to them. Also, it is stated that compliance with the scope of the agreement is subject to the granting of the access permit. In this manner, the only way that a negotiation may be affected is if a permit were not granted at all, as has occurred in countries such as Colombia or Brazil.

In the case of academic organizations, mainly material transfer agreements have been used and, in these, the sovereignty of the State over the biological resources has been emphasized. The use of the biological resources for purposes different from the ones of the agreement or for nonauthorized uses is precluded. INBio also reserves the right to intellectual property when applicable and the possibility of benefits in the case that a *protectable* discovery is found with possibilities to generate intellectual or economic gains.

National conservation policies and the level of awareness attained by Costa Ricans in regard to the importance preserving and sustainably using biodiversity as well as the existence of organizations like INBio have favored the establishment of bioprospecting agreements or contracts. In RCAs with national and international companies (pharmaceutical, biotechnological, agricultural) the scientific collaborations are structured under the philosophy of the State being a partner, not a supplier. Companies know about the enforced legislation from the beginning, they recognize the sovereignty of the country over its resources, and accept that compensation will be required for their use.

All of this has been possible thanks to the security and political and legal openness that the country has offered and, in particular, to the support provided by INBio. But not everything has been easy. The national and international critiques of INBio in reference to the signature of the original Merck agreement are well known and still remain today, particularly by those who insist on measuring the success of the relationship only in terms of monetary benefits and not by taking into account the benefits of training, infrastructure, capacity building via equipment, and positioning of INBio and the country as a true partner in the systematic search for products derived from biodiversity.

5.2 Key technologies used in the context of active bioprospecting projects

5.2.1 Bioprospecting projects: Objectives, partners, and negotiation process of contracts

Current bioprospecting projects are subdivided into two broad thematic areas: chemical prospecting and biotechnological prospecting. Within the framework of the former prospecting strategy, natural products – in spite of being valuable sources of therapeutic agents – have been alternately acceptable and unacceptable targets in pharmaceutical drug-discovery programs. This has been evidenced as well in the types of projects that INBio has pursued in recent times which are mostly academic, focusing on neglected tropical diseases. Projects typically last for several years, as was outlined above for inactive projects. Few of the past and current projects last for only one year and they are usually very limited in scope.

5.2.1.1 Chemical prospecting projects

In the chemical prospecting realm, INBio participates in the ChagaSpace Project (for more information visit the web page www.chagaspace.org). This multicenter project – headed by Dr. Lawrence DeLucas from University of Alabama at Birmingham, AL USA – focuses on finding

a solution to one of the most serious problems in public health of Latin America: American Trypanosomiasis or Chagas disease. INBio's participation involves the extraction and isolation of inhibitors of trypanothion reductase from selected plants and microfungi extracts. A total of nine participating institutions in five countries collaborate on this project: the National Aeronautics and Space Administration and the University of Alabama at Birmingham in the USA; the Escuela de Agricultura de la Región Tropical Húmeda (EARTH), the Universidad Nacional, and INBio in Costa Rica; the Universidad Católica del Norte and the Universidad de Santiago de Chile in Chile, the Universidad de la República in Uruguay, and the Instituto Nacional de Parasitología in Argentina. INBio negotiated its participation in this federally funded consortium through an agreement with EARTH.

In 2003, INBio started participating in a regional project entitled 'Utilization of regional flora as a source for antifungal, antiparasitic and anticancer molecules' headed by Dr. Mahabir Gupta at the Universidad de Panamá. The partners have been Universidad Nacional de Rosario in Argentina, the Universidad Mayor de San Andrés in Bolivia, the Universidad Nacional de Colombia in Colombia, the Universidad de San Carlos in Guatemala, and the Centro de Investigaciones Farmacognósticas de la Flora Panameña at the Universidad de Panamá and the Instituto de Investigaciones Científicas y Servicios de Alta Tecnología in Panamá. This project is funded by the Organization of American States (OAS) and involves the preparation of selected plant extracts to be assayed by the partner institutions as well as fractionation of promising extracts. INBio was invited to be a part of this consortium in 2003 by the principal investigator.

In order to follow up on the promising leads generated through the OAS-funded project, INBio applied for grant funding from the local Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICIT). The grant was approved and the project entitled 'Phytochemical study of four selected species for the discovery of natural products with antifungal, antiparasitic and anticancer activities' was initiated.

INBio is participating with Harvard University, Cambridge, MA USA in two grants, both recently approved and financed by the National Cancer Institute (NCI) and the Fogarty International Center at the USA National Institutes of Health. While the focus of the first grant, which is led by Dr. Chris Ireland from the University of Utah, is primarily centered on cancer, the second one, led by Dr. Jon Clardy, has a broader approach and includes central nervous system afflictions, cancer, and tropical parasitic ailments among others. In the case of INBio's participation the focus is on microfungi.

Thanks to the support of an Inter-American Development Bank/Multilateral Investment Fund project granted in 2000, INBio gained a relationship with the national productive sector and it was possible to apply the knowledge and technology acquired through the alliances with large companies. Under the scope of this support, INBio collaborates with Laboratorios Lisán S.A., a Costa Rican company, in a project to develop pharmaceutical products from popular medicinal plants. The first product from this collaboration, known as Q-assia®, was launched in 2004 and yielded the first royalty stream for INBio. This first product is based on a standardized extract of a tree from the Costa Rican flora known popularly as 'Hombre Grande' (big man) and whose scientific name is *Quassia amara* in the Simaroubaceae family. A second product was launched recently in 2006, marketed as Estilo®, and it is produced from a standardized extract from *Justicia pectoralis*, a tall herb in the Acanthaceae family. It was from the sale of Q-assia®, that INBio and MINAE received the first royalties for the access and sustainable use of Costa Rican biodiversity. Both products are produced and sold by the natural products branch of Laboratorios Lisán, called Lisanatura and the technological development transferred from INBio to the Costa Rican company involved the optimization and quality control of extracts, analytical methods to monitor standardization, and evaluation of suppliers of raw material. The research collaboration agreement signed with Lisán was profiled as a case study (Rosales 2004) in a project sponsored by the United Nations Development Programme's Special Unit for Technical Cooperation among Developing Countries, the Third World Academy of Sciences, and the Third World Network of Scientific Organizations.

An agreement with a Japanese academic institution has been recently approved and signed to evaluate the potential of Costa Rican plants in selected human health target areas. This constitutes INBio's first agreement with a Japanese university and the project is scheduled to continue until 2008. The collaboration will be expanded

shortly to develop potential biotechnological products.

5.2.1.2 Biotechnology prospecting projects

INBio has three on-going biotechnology-based projects with local partners:

- A preliminary study about the value of endophytic fungi controllers of banana diseases. INBio partners with a local biotechnology company 'BioTécnica Análisis Moleculares S.A.' headed by Dr. Kenneth Madriz in this pilot project funded by the Netherlands Development Aid. The aim is to generate a collection of nonredundant endophytic fungi isolated from banana plants, with the potential to control diseases that attack this important crop.

- Micropropagation of 'champion orchids', a project that is concluding whereby INBio propagates diverse species of orchids which are later to be commercialized in order to avoid the problems caused by widespread extraction of these species from the forests. This project was funded by Fundación SACRO (Save Costa Rica's Orchids).

- Morphological and molecular evaluation, and natural history of the 'pica-caballo' spiders of the genus *Sericopelma* (Arachnida, Theraphosidae) in Costa Rica, a project that merges basic research with inventory in order to identify species adequately and to research the microfauna living in their excrement and venom. Phase I of this project has been funded by CONICIT.

Additionally, there are two projects with international counterparts:

- Gene Prospecting – Phase II, a productive collaborative research project with Diversa Corporation to collect samples of microorganisms associated with larger organisms such as insects from aquatic environments, forest soils, and other locations. This agreement was highlighted in 2002 at the Sixth Conference of the Parties of the CBD as an access and benefit sharing agreement (CBD 2002). INBio processes the samples and Diversa looks for enzymes and structural proteins that can be used for industrial biotechnology, crop protection, and pharmaceuticals. Through this collaboration, there are many products in the pipeline. The first of these products, a fluorescent protein and an enzyme that assists in the industrialization of cotton have already been announced and are in the market. Royalties received from this collaboration have also been shared with MINAE for conservation purposes.

- Forest bromeliads: ornamental potential and conservation which is a project with a local ornamental company that has its headquarters in the Netherlands. This exciting project searches in Costa Rican protected areas for selected bromeliad species with ornamental potential.

INBio-Bioprospecting has also diversified its service portfolio to include fractionation services using its BioXplore© technology, educational talks, capacity building on negotiation processes, chemical analyses, and biological assays, among others. It has also strengthened its scientific guidance by establishing a Scientific Advisory Board with outstanding professionals both in the corporate and academic sectors. It is without a doubt that the negotiation processes in terms of bioprospecting have evolved. In time, the infrastructure, equipment, and mainly the acquired technology and knowledge have enabled INBio to establish relationships in more favorable conditions.

With a beginning in chemical prospecting and the establishment of a number of agreements in this area, INBio has a first-rate chemical laboratory, with qualified researchers in the development of projects that involved extraction, protocol standardization, and even structural elucidation. This has facilitated the establishment of agreements with the pharmaceutical industry, but also of research agreements with universities and research centers of great prestige such as Cornell University, Harvard University, and the National Cancer Institute in the USA and the Swiss Tropical Institute, to name a few.

Biodiversity prospecting did not stop at chemical prospecting. With the establishment of agreements with biotechnology industries, INBio established a Plant Biotechnology Laboratory, a Molecular Biology Laboratory, and a Microbiology Laboratory. Particular and specific projects are developed in each laboratory. But at the same time, activities to support chemical prospecting are carried out – be it development of cultures of undifferentiated tissue or ferments of microorganisms for the subsequent search for secondary metabolites.

With the passing of the years, there has been a diminished interest by pharmaceutical companies for natural products, so it has become more difficult to establish agreements in this area. Companies are not willing to invest large sums in random research. Biodiversity *per se* is not the only driver. Adding value to samples, not only from the standpoint of processing, but also from an information perspective about proven applications is preferred. Because of this, the strategy in past years has been to strengthen the Scientific Advisory Board, to widen the web of academic collaborators, and to access grants through strategic partners which would allow INBio to show attractive results for industry.

Along the same lines, emergent biotechnology industries have been an interesting option because they are a channel to reach larger companies both in the pharmaceutical and agricultural sector. The caveat there is that the research budgets do not compare with the ones that large companies were once willing to contribute.

This is how the portfolio of projects of INBio has been changing with time, giving more importance each time to the establishment of projects funded through grants for the generation of information about uses of Costa Rican biodiversity and their potential application in the control of important diseases such as cancer, AIDS, diabetes, Alzheimer's and other neurodegenerative diseases, malaria, and Chagas among others.

INBio also started to develop in-house projects, supported by funding from governmental organizations and other donors. The general interest is to continue to attract large industries to look at biodiversity as a source for new discoveries, so that national capabilities continue to be strengthened for the generation of knowledge about the value of biodiversity as a source for products and to support and tend to the needs of the national productive sector based on the intelligent and sustainable use of Costa Rican biodiversity.

5.2.2 Scientific technologies in the context of current bioprospecting projects

As commented previously, the Bioprospecting Strategic Action Unit has developed infrastructure to conduct basic chemical and biotechnological prospecting. As chemical prospecting deals with natural small compounds with potential value to the agrochemical and pharmaceutical industry, most proposals begins with the definition of the biological screenings that will be used, in order to define the quality of the sample needed. It is the current trend however, to avoid testing crude extracts in biological screenings (Eldridge *et al.* 2002).

Natural products have always accounted for drug discovery with exceptional hit rates. The review presented recently by Newman *et al.* (2003) provides a thorough and detailed analysis of the contribution of natural products to the development of therapeutic agents. For example, in the period of 1981 to 2002, almost half of small-molecule *New Chemical Entities* were either natural products or compounds based on natural products scaffolds. Nature has been able to provide very complex structures and therefore it is expected to offer a higher chemical diversity than synthetic compounds (Clardy and Walsh 2004, Koehn and Carter 2005).

Despite this clear trend and the service that natural products have provided to the pharmaceutical industry, most companies shut down or downsized their natural products branches and invested heavily in the construction or acquisition of synthetic libraries. This has been the trend since the early 1990s, when two technological breakthroughs made their appearance: *combinatorial libraries* and *high throughput screening* (HTS) systems. HTSs are designed to screen automatically at least one thousand samples per day; therefore, throughput or number of samples available for screenings becomes the issue. Additionally, the post-genomic era provides highly valuable information of metabolic pathways and the discovery of key molecular targets is possible. The understanding of diseases now translates also to better and improved assays, which may also provide the information of a possible mechanism of action. These assays evolve usually every three months, and therefore, the chemical structure of a positive tested sample must be elucidated within that period. This sort of information is available prior to screening when dealing with a synthetic or combinatorial library, which is often not the case with natural products. This fact, in addition to the 're-supply issue' explained before, is the main reason why natural products have been unpopular within recent drug-discovery strategies. Natural sources were tested traditionally as extracts on *in vitro* whole-cell assays and therefore chemical composition was usually not known. With the develop-

ment of target-based screenings, extracts cannot always be used, mainly because of the complex constitution of natural compounds (ranging from 10 to 200), possible interference with the detection method and finally, the actual concentration of the active metabolites within the matrix.

To some important extent, these challenges have been addressed by different organizations (Abel *et al.* 2002, Eldridge *et al.* 2002) and INBio is not the exception. In order to study less complex matrixes, increase the number of samples for screening, and handle samples ready for automated screening and structure dereplication, the logical strategy is to either pre-fractionate (to produce fractions with two to five compounds maximum) or to fractionate (to produce fractions with one major component with at least 75% purity).

INBio has established the BioXplore© Technology, the initial platform to produce a significant number of fractions or compounds from complex matrixes. The system is fully automated and can fractionate a fairly clean extract of 5 to 10 grams in about 2 hours. It can be programmed to different conditions according to the sample size and nature and provides also the resources to clean crude extracts prior to fractionation when needed. The BioXplore© Technology can generate up to 1,500 fractions per week and while there are still some features that need improvement, it has provided services already to industries and research institutions in Costa Rica and abroad. The system is also designed to produce compounds with at least 90% purity and has been used to produce natural standards for the validation and standardization of herbal products and phytopharmaceuticals.

The infrastructure that is currently at INBio enables scientists to perform selected biological screenings. In 1994, INBio set up a small microbiology facility to perform antibiotic tests. Later on, INBio increased its portfolio of screenings to include a *Caenorhabiditis elegans* test for detection of nematicidal proteins, the basic brine shrimp test for general toxicity and, more recently, antifungal tests for the detection of pathogen inhibitors, the *Aedes aegypti* larvicidal test, and a molecular target assay for the development of anti-chagassic leads, based on the inhibition of trypanothione reductase, *Plasmodium falciparum* glutathione reductase, and the human glutathione reductase.

INBio considered expanding the screening facility, but it was clear that significant investment would be required. On the other hand, INBio has built a large and long-lasting number of collaborators, who in turn, have top-of-the-line screening facilities or have access to them. INBio focuses its in-house efforts towards tropical diseases, especially Chagas disease, one of the most striking diseases causing high rates of mortality and morbidity in Latin America.

The 2003 RCA with the Institute of Chemistry and Cell Biology (ICCB) at Harvard Medical School that allowed HTS of INBio's extracts and thousands of fractions from fungal strains was made possible by an R-21 planning grant financed by several USA institutions: Fogarty International Center, National Institute of Allergy and Infectious Diseases, the National Institute of Mental Health, the National Science Foundation, and NCI. The HTS resources that ICCB offers are rather large even for academic standards. Natural products are prepared in 96- and 384-well microtiter plate formats. By the end of the project (April, 2005), INBio was able to set up a large culture facility that screens hundreds of fungal strains added per year. This project provided a nice example of how INBio had to increase capacity, improve protocols, re-create methods to optimize extraction, improve yields, and, finally, formulate a data system large and diverse enough to track samples from collecting up to pre-fractionation.

The project had several different goals and challenges. The most important goal was to create the basis for the research collaboration with ICCB from the legal and technical standpoint. Once the agreement was signed, activities related to collection, culturing, fermentation and preservation of fungal endophytes, extraction, and pre-fractionation of their cultures were set up and improved, with the aim to increase the number and the quality of samples. This had to be done in a time frame of less than two years, which was accomplished. It involved several workshops on culturing, preservation, and preliminary morphological taxonomy and provided the basis for the execution of the project.

The infrastructure built to conduct chemical prospecting has evolved throughout the years, to respond accordingly to different needs and trends of the drug-discovery scenario. Nevertheless, as commented before, the pharmaceutical industry invested significant funding

in building synthetic libraries, which by typical standards, are in the 10^6 range. This, however, is beginning to change towards the acquisition of natural products, which must be prepared in formats agreeable to HTS standards.

INBio also grew in the gene prospecting area. The Bioprospecting Unit recognized the opportunity of biotechnological and genetic prospecting, and therefore has invested lately on potential ornamental plants, microorganisms (cultured and uncultured), and molecular taxonomy. The Plant Biotechnology Laboratory, set up in 1998, developed protocols for micropropagation of leads and is currently producing orchids, bromeliads, and other potential ornamentals. These *in vitro* plants could be either introduced in the market as baby plants (export) or could be transferred to a nursery facility for national distribution.

Microorganisms are a rich source of secondary metabolites and proteins. In this regard, INBio invested in training of human resources and equipment acquisition to set up the microbiology and mycology laboratories for bacterial, actinomycetes, and fungal isolation and culturing. These resources will be expanded shortly thanks to the recently awarded grant (end of 2005), as part of the ICBG project, which continued the efforts under the R-21 grant described earlier.

On the topic of uncultured bacteria, INBio is participating on an exciting project to discover cellulases (Brennan *et al.* 2004) that could degrade cellulose to glucose. Diversa Corporation, along with the California Institute of Technology, Pasadena, CA USA (Caltech) and the USA Department of Energy Joint Genome Institute, is supporting this initiative at INBio. Termites primarily are being used as a source of bacteria. Bacterial DNA is extracted and screened for cellulitic activity. The final aim is to obtain enzymes able to assist in the conversion of biomass into value-added products, such as glucose and ethanol.

The alliance with Diversa Corporation has been very strategic to build capacity of human resources and to set up the molecular biology laboratory. The laboratory is currently focused on DNA extraction, which could be sequenced abroad and analyze afterwards for molecular taxonomy determination and phylogenetic analysis. Following up on this capacity and under the R-21 umbrella, INBio evaluated a random selection of 100 endophytic fungal isolates to determine the redundancy and diversity of the collection of more than 700 strains gathered in seven months' time. Currently, INBio is also participating, along with the University of Costa Rica and with the support of the Organization for Tropical Studies and the Instituto Centroamericano de Administración de Empresas (Central American Business School) in the evaluation and analysis of DNA data obtained from two marine water samples, gathered by the Sorcerer II expedition at Coco's Island, as part of the Global Program initiative of the J. Craig Venter Institute. It is expected that this sort of information will provide a better understanding of ecosystems and assist in their management.

5.2.3 Contractual provisions: Addressing scientific issues and transfer of technology

No two agreements are exactly the same and the negotiation process in each case is profoundly affected by the people and policies of the institutions involved. Having said this, throughout the negotiation processes, the INBio team keeps in mind the key elements addressed previously and conveys them to the partnering organization from the beginning. The technology transfer and training component-related contractual provisions include elements such as: transfer of proprietary information and equipment, training sessions, protection of inventions, and guidelines for publications which shall be addressed below.

5.2.3.1 Transfer of proprietary information and equipment

This clause is typically associated with the confidential information provision. Partner organizations transfer proprietary information (i.e., protocols), clearly marked as 'confidential', so that INBio can use it in the performance of the research activities under the agreement. INBio may continue to use the information for internal purposes as long as it does not disclose the confidential information to a third party. Confidential information is protected for a defined period of time. All the staff working on the project sign confidentiality agreements to ensure protection of the proprietary information. In

the case of subcontracting of certain activities, the same provisions apply. INBio scientists may also optimize the protocols and make corrections for the partner along the way so the partner also benefits from these upgrades.

There have also been agreements, especially in recent times, where the protocols used are the ones INBio has optimized through the years. The partner does not supply proprietary information for the early stages of the project. Its proprietary information might be more focused on the screening aspect of the collaboration.

In those cases where INBio does not have the appropriate equipment to conduct the research, the agreement includes the donation of those resources to INBio, and while most agreements are very flexible in their broader utilization, certain agreements restrict their use for length of the agreement term. Others are left wide open for the equipment to be used whenever it is needed. In all the different collaborations, one core element stands out: once the project concludes (project becomes inactive), the equipment is property of INBio or its local collaborators (as the case may be) and may be used for subsequent projects. This is how capacity building is ensured. All technologies acquired by INBio involve heavy reliance on infrastructure and equipment.

5.2.3.2 Training

Agreements typically include provisions for local scientists to be trained by the partnering institution either in the partner's facilities or in INBio. Some of the agreements that are for two or more years stipulate formal follow-up training sessions at least once per year. The training sessions are targeted to at least two local scientists each time to ensure that the knowledge can be transferred adequately to the rest of the team working on the project and to secure the continuity of the research in case one person were to leave.

5.2.3.3 Protection of inventions

Standard agreements address this issue by defining three categories of inventions: sole inventions by INBio, sole invention by the partner, and joint inventions. Compensation is negotiated regardless of who owns the inventions that give rise to a product since the materials ultimately originated from Costa Rica. Diverse scenarios for licensing of sole inventions by INBio to the partner, assignment of rights, and maintenance of patents may also be included. In federally funded projects, rights to inventions by the donor are addressed in the agreement as well.

5.2.3.4 Publications

In many agreements, provisions for joint and independent publications are included. Manuscripts have to be revised by each of the parties and in some cases approved for publication. Contributions by each of the parties' researchers and the funding sources have to be accurately acknowledged.

Publications when dealing with corporate partners have not been easy, especially since companies are very protective of results in order not to jeopardize the intellectual property. This has been one of the obstacles in getting the word across about the value of biodiversity based on concrete results. However, efforts along these lines have been made with corporate partners such as Diversa (Brennan *et al.* 2004) and Laboratorios Lisán S.A. (Rosales 2004).

5.2.3.5 Benefit sharing

Research budgets, milestones, and royalties payments are in accordance with the agreed-upon activities, added value, and intellectual property rights. In the former, activities are thoroughly described in a work plan that is an annex to the RCA. Milestones and royalties are negotiated up front and depend on several issues, such as targeted markets in addition to those already mentioned.

The national and international industrial partners provide the research budget for the proposed project and an additional up-front fee for conservation consisting of 10% of the said research budget amount is also negotiated. The 10%, if granted, is forwarded to MINAE. From these up-front fees (generated from 1991 through 2004), more than US$600,000 have been transferred to MINAE for conservation-related activities. Budgets range from a few thousand dollars to the famous one million-mark set by the 1991 INBio-Merck & Co, Inc. agreement. Additionally, these bioprospecting deals have contributed more than US$1,500,000 to the conservation areas and public universities of Costa Rica. The approximate economic value of the training of local scientists, the equipment, and infrastructure that these deals have meant exceeds US$1,700,000. In terms of royalty payments based on sales of products generated through collaborations, INBio has received payments from Laboratorios Lisán S.A. and from Diversa Corporation. Al-

though this is a small quantity, it has been very significant and it has already been shared with the MINAE for conservation. Furthermore, INBio still sees significant potential in this regard within the current agreements. It takes several years from basic research to potential patenting and commercial application of active agents and INBio has been apprised of promising developments for year 2007.

When INBio makes a larger contribution to the research and development phases in terms of expertise, proprietary information, equipment, and infrastructure, the Institute has more room to negotiate monetary benefits. This has been the case for the collaborations with local companies and, in recent times, for certain collaborations with international organizations. Negotiators emphasize the INBio strong points from a scientific and technical perspective, but also recognize weaknesses that would need to be addressed during the project. When INBio has added little value from a scientific and technological standpoint, nonmonetary benefits such as equipment and training were emphasized.

5.2.4 Technologies and scientific training transferred to INBio

INBio relies significantly on its collaborators to build internal capacity and to access new technologies. As discussed before, INBio's RCAs involve access to protocols, training opportunities, and technology transfer. All collaborations with foreign institutions and industries include this sort of noneconomic benefits, which in the long run, permeate to national institutions and industries.

Three examples will be discussed briefly. In 1998, Eli Lilly & Co., Inc., Indianapolis, IN USA, began an ambitious program called Isolating Compounds from Extracts (ICE). The aim of the project was to produce clean fractions in an automated fashion, which will be submitted later on to molecular target screenings. In 1999, the company signed an RCA with INBio, to obtain fairly clean plant extracts. The work plan covered a period of 12 months, and involved two months of training of two INBio chemists on the ICE strategy at Eli Lilly, as well as access to the cleansing protocol for plant extracts and feedback on the chemical analysis of the fractions. After the finalization of the RCA, INBio attempted to acquire an alternative technology to ICE and in 2001 began a negotiation process with Eli Lilly for the donation of the equipment, which was achieved by 2002, thanks to the support of CR-USA and the Amigos of Costa Rica foundations. The donation included the refurbishing of the equipment, training of personnel on basic maintenance, transportation, and installation at INBio. Additionally, it included a significant amount of consumables that included chromatographic support and supplies for the plant extract cleansing protocol. INBio developed human interface software to operate peripherals. This set up resulted in the BioXplore Technology©, described earlier. The final transferred technology has an approximately value of US$1,500,000.

Diversa renewed the RCA (formerly with Recombinant Biocatalysis, Inc.) with INBio in 1999 for a period of two years and the collaboration was extended in 2001 for an additional six years. The training of INBio scientists is the focal point of the collaboration, whereas each year the personnel receive training either *in situ* or at Diversa's headquarters. Diversa provided the equipment for the setting up of the molecular biology laboratory and contributes with reagents and access to their technology for in-house projects. As a result of this collaboration, INBio co-authored a publication on the xylanases program in 2004 (Brennan *et al.* 2004), and many more are expected to occur in the near future. The training in year 2005 and 2006, involved the participation of experts from the Joint Genome Institute, CalTech, and Diversa, who traveled to Costa Rica.

Finally, the research collaboration agreements based on USA federal funding are focused mainly on capacity and infrastructure building. The ICBG planning R-21grant, awarded to Harvard and INBio in 2003, provided for a number of workshops on isolation and culturing of endophytic fungi (2003) and on development of taxonomic skills (2004). As a result, INBio's scientists are able to design and improve protocols for culturing by evaluation of chemical fingerprints, to initially discriminate ubiquitous fungi, and to use molecular techniques to evaluate redundancy and diversity. Towards the end of the grant, INBio and Harvard built a strong infrastructure for the collection, isolation, preservation, culturing, extraction, and pre-fractionation of fungal samples and set up a culturing room for medium-throughput fermentations.

These examples illustrate the potential of research collaboration following the framework initially established. Many of INBio partners have made considerable investments in the development and protection of both their technology and intellectual property. In the majority of agreements, the partners, especially international ones, have contributed these two elements to the projects being undertaken. INBio has emphasized technology transfer and training when these collaborations have been structured. What the Institute brings to the negotiating table are limited access to biodiversity, a clear legal framework, a skilled human resource, the ability to provide intermediate products, and a contribution to biodiversity conservation.

When INBio has limited expertise on the topic of the proposed project, its negotiating strategy focuses on capacity building and on the idea that this research would be more cost effective for the partner when carried out by local scientists. In this scenario and depending on the value that the organization can add to the overall process, the agreement reflects INBio's contribution and the associated benefits. When INBio acts as an implementer of technology that is proprietary to the partner, optimization takes place but the Institute has little influence on the scientific direction.

In other instances, INBio is the holder of the chemical or biotechnological prospecting expertise in the project and hence its impact is significantly different. In the agreements with national companies, INBio brought to the projects expertise that another party would rarely have been able to provide and created technological packages (protocols) that were transferred to the local partners – together with training – for implementation and scale up. Partner organizations were also responsible for production and commercialization aspects. As can be perceived, tables were turned and INBio was the one building capacities within the country and the agreements signed with the Costa Rican companies reflected this. More interactions on the overall scientific direction of the project occur when INBio contributes directly with know-how and technology.

It is important to clarify that benefits are negotiated both when technology is transferred from the partner to INBio and vice versa. The guiding principle being that Costa Rican biodiversity is being accessed and researched to see if a potential product can be derived therefrom and that both the organization and the country are entitled to benefits from such products. Of course, when INBio adds more value to the overall process, the percentage of the benefits negotiated is higher.

5.2.5 Issues that may hinder science and technology transfer

Agreements have been tools used for the empowerment of national scientists. In spite of this fact, there might be some issues that could be improved in the structure of RCAs, which must be negotiated beforehand.

Equipment: Some RCAs establish that only their own nationally manufactured equipment can be purchased or donated. This is a limitation, since not all manufacturers produce quality hardware. Additionally, developing countries lack certain needed support infrastructure; without it, the proper operation of the equipment is compromised. Maintenance and repair is usually slow and expensive, and therefore, a developing country has to evaluate carefully the type of infrastructure it can support. Some RCAs restrict the use of the equipment to a particular project, which is not desirable when maximizing resources is key. Finally, some countries have high import taxes even for equipment that is supposed to be used for building national human capacity. Some of these issues are hard to overcome, since they are external to the negotiation process and to the agreed RCA. Nevertheless, efforts are focused on obtaining proper and fair technology and equipment and to secure their maintenance in the long run.

Training/capacity building: Training is centered – as can be expected – on the areas and programs of a given RCA and therefore, it is highly likely that some key technologies are left aside. One alternative to this unavoidable fact is to negotiate at least one training possibility following the needs of the Institute. This is highly feasible but must be included in the negotiation. Training must include as well the elements for maintenance and repair of hardware. One sensitive aspect that must be carefully considered is the possible nurturing of overqualified personnel that could feel unchallenged if the proper infrastructure is not in place. If an institution has a strategic plan for capacity building, this issue becomes

unimportant. On the other hand, the investment in training human resources must consider the possibility of critical mass loss. In a project-driven research model this is a fact of life that has to be dealt with.

5.3 Mergers, assignments and market impacts

Contractual provisions have been evolving while INBio has been strengthening its technological capacity. Technological development and the mergers that companies are involved in to acquire innovations, especially in the biotechnology area, have obligated INBio to adapt contractual provisions in its bioprospecting agreements, particularly those related to the definition of 'product', the assurance of accurate tracking of the information generated, and the future benefit margins in accordance with the added value of products developed.

Currently, pharmaceutical and biotechnological companies target the search of novel products for different markets, so it is necessary to foresee all possible developments that may arise from a given sample. This is especially important when considering projects in the gene-prospecting area, in which biotechnological tools allow the multiplication and manipulation of the genome. Hence, contractual provisions are established in order to obtain as much information as possible of the use and destiny of the samples, which include reporting and the possibility of INBio auditing the companies where much of the investigation takes place. In the same manner, it is stated explicitly that Costa Rica is the owner of the resource and that as such it must be compensated in case of future benefits.

There is no doubt that with technological advances, the elements of biodiversity may attain an insurmountable value, given the potential of the unknown and the capability of human beings to add value along the development chain of a product. This is why other provisions related with the compensation of potential benefits derived from intermediate products or products that advance in the development pipeline or 'milestone payments' have been stipulated. Milestone payments are received before a product reaches the market. In the earliest bioprospecting agreements, these payments were not contemplated.

While INBio has acquired knowledge and strengthened its technological capacity to meet the demands of diverse companies, it has established provisions to include the possibility of INBio becoming a developer and the sole owner of a product obtained from the same samples shared with companies. In this scenario, INBio may apply for patents individually or in a joint manner.

Another aspect that has been reinforced contractually has been the confidential nature of certain information and restrictions against sharing it with third parties. It could be argued that projects that use high technology to decode the genome of diverse organisms whose intent is to make information public and free to all, independently from their origin, jeopardize the sovereignty of the countries over their resources and truncate the possibility of future benefits in those cases when that information is used with commercial purposes by third parties. Hence, the current contracts are very strict in these matters and the aim is – above all – to guarantee that the material shall only be used by the partners for the stipulated uses and if it needs to be transferred to third parties, it should have the corresponding authorization by INBio. Additionally, the new recipient has to assume the responsibilities of the original one.

Conclusions

There are several key components to the development of bioprospecting within INBio as discussed in the previous sections. Science and technology have clearly influenced the way that INBio negotiates and conducts its activities. Information and communication technologies have greatly facilitated contact between prospective partners and INBio in a cost-efficient manner. The fully digitalized biodiversity informatics database, the bar-coded label system to track every sample from beginning to end, and the automated fractionation process are all assets that are highlighted in negotiations.

From a general standpoint, the Bioprospecting Unit has built its credibility on scientific knowledge, legal and responsible access to biodiversity, highly skilled human resources, and processing technology. These are the core

elements of its negotiation position. As explained in this chapter, research collaborative agreements have been a channel for technology transfer (lab facilities, protocols, and high tech and standard equipment), access to current information (selected partners provide INBio with publications and share presentations on their recent advances and work during their visits), and the training of national scientists.

The basic technologies acquired enable INBio to perform activities in country and have formed the core of the chemical and biotechnological processes which are managed by a multidisciplinary team. The capabilities in place for bioprospecting are rarely found in research institutions in developing countries and put INBio in a solid position when an RCA negotiation begins. Additionally, the unique organizational platform of INBio is not easy to replicate, it is a hybrid, combining a museum, a chemical and biotechnological laboratory, and an educational center.

It should not be forgotten that bioprospecting, from the INBio standpoint, is one more avenue to travel the path to conservation. As such, advances in the science and technological aspects are really geared towards an improved position to promote the awareness of the value of biodiversity.

Finally, the clear legal framework that Costa Rica has adopted, is the basis of any given bioprospecting collaborative agreement. In spite of the fact that improvements on the legal framework can still be made, INBio has helped CONAGEBIO in its implementation and several permits have been awarded to INBio since the entry into effect of the National Guidelines for Access to Genetic and Biochemical Resources in December 2003.

Undoubtedly there are many assets that a biodiversity-rich country can bring to the negotiation table with an industrialized country, but the technological gap will be hard to overcome. The most successful approach in INBio's experience is the development of a web of strong and enthusiastic collaborators, which enables access to high-tech infrastructure and cements long lasting relationships.

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6 Access Issues Related to the USA National Cancer Institute's (NCI) Natural Products Drug Discovery and Development Program[1]

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The NCI (http://www.nci.nih.gov) was established in 1937, its mission being 'to provide for, foster and aid in coordinating research related to cancer'. In 1955, NCI set up the Cancer Chemotherapy National Service Center to coordinate a national voluntary cooperative cancer chemotherapy program, involving the procurement of drugs, screening, preclinical studies, and clinical evaluation of new agents. The responsibility for drug discovery and preclinical development at NCI now rests with the Developmental Therapeutics Program (DTP) and the subsequent clinical development, generally up through Phase II human trials, is conducted by its companion program, the Clinical Trials Evaluation Program, both being the major components of the Division of Cancer Treatment and Diagnosis (DCTD). Thus for the past 50 years, NCI has provided resources for the preclinical screening, and if warranted by the activities found, clinical development as well, of compounds and materials submitted by scientists and institutions, public and private, worldwide, and has played a major role in the discovery and development of many of the available commercial and investigational anticancer agents.

During this period, more than 500,000 chemicals, both synthetic and pure natural products, have been screened for antitumor activity using a variety of screening methods ranging from *in vivo* studies against murine tumors, through human tumor xenografts in immunodeficient mice to isolated human tumor cell lines and molecular targets expressed in a variety of formats with the initial systems varying with chronological time.

At first, most of the materials screened were pure compounds of synthetic origin, but the program also recognized that natural products were an excellent source of complex chemical structures with a wide variety of biological activities so 'samples of opportunity' were obtained from a variety of sources both inside and outside of the USA government. Thus in the period from 1960 to 1982 (i.e., beginning more than 30 years before the United Nations Convention on Biological Diversity (CBD) was adopted, and continuing until about to 10 years before that date) over 180,000 microbial-derived, some 16,000 marine organism-derived, and over 114,000 plant-derived extracts were screened for antitumor activity, mainly by the NCI, and from these, as mentioned above, a number of clinically effective chemotherapeutic agents have been developed (Cragg and Newman 1999, 2005)

6.1 Contract collections: 1986 to the present. The NCI letter of collection (LOC)

Between 1982 and 1986, the DTP revised its complete screening system moving to an initial *in vitro* 60 human tumor cell line assay and decided to reinvigorate the natural products collection system by instituting a systematic collection of marine invertebrates and terrestrial plants in 1986. The focus for marine organism collections was originally the Caribbean and Australasia, through collection contracts with organizations in the USA, Australia, and New Zealand, but in 1992, following a competition open to qualified worldwide organizations, the focus was expanded to the central and southern Pacific and to the Indian Ocean (off eastern and southern Africa) through a contract with the Coral Reef Research Foundation in the Federated States of Micronesia, originally based in Chuuk and from 1996 in Palau. The contract was renewed in 2002, permitting subcontractors for the first time in 10 years, and collections are now worldwide. Terrestrial plant collections were also initiated via com-

1 This chapter reflects the opinions of the authors, and not necessarily those of the USA Government.

petitive contracts and, to date, have been carried out in over 25 countries in tropical and subtropical regions worldwide through contracts with the Missouri Botanical Garden (MBG) (Africa and Madagascar), the New York Botanical Garden (Central and South America), the University of Illinois at Chicago (Southeast Asia), the Morton Arboretum and World Botanical Associates (USA mainland and territories), though these plant collection contracts expired at the end of September 2005. Reinstitution of plant collections will depend upon budgetary factors. Over 60,000 plants samples were collected during this period, and the repository of over 120,000 extracts will continue to be studied as a source of potential agents for the treatment all human diseases as discussed below in the section on distribution of extracts.

6.1.1 Access to source-country resources

From the beginning of these systematic collections, all of the NCI collection contractors were required to obtain all the necessary permits, including visas and collecting, shipping, and export permits from the appropriate source-country government (SCG) agencies or departments. In previous collections the samples came from a variety of sources including the USA Department of Agriculture (USDA), companies (predominately the microbial extracts), and from 'collections of opportunity', methods that had been utilized by organizations in many countries in the years prior to the CBD.

However, it was realized by NCI from the beginning of the systematic collection processes that there should be a formal recognition of the efforts expended by the source countries in permitting such collections. Therefore concomitantly with the initiation of these collections, efforts commenced within the NCI to devise a method that could aid the source countries in the event that a successful agent was developed from a sample collected in their territories with their prior permission.

There is one very important difference between any document that may be used by a USA government agency (such as the NCI) and any other organization in the USA, including academic institutions or nonprofit organizations funded by NCI or its parent, the National Institutes of Health (NIH) and that is as follows. The NCI is not permitted to 'encumber a future invention' in any agreement (35 USC 200). What this means is that unless there has been an invention no formal royalty statement may be used in an agreement. Thus NCI was specifically forbidden to use phrases such as 'royalties will be X% of sales' in any collection agreement because the simple act of collection is not an inventive process, contrary to what is often assumed by groups unfamiliar with such operations.

Another aspect to this is that a very large number of both organizations and countries did not fully understand that the definition of an inventor in the USA is defined by national patent law and is significantly different from the criteria for authorship of a scientific paper. In fact, if a person who is not an inventor is placed on a USA patent, or a person who is, is not put on a patent, that patent can be successfully challenged (35 USC 102). Since the only way that NCI can assure that benefits can flow back to a source country is by licensing such a patent for pharmaceutical development and ultimate commercialization, requests or even demands by a country's permitting authorities that there must be a source-country scientist(s) on a patent is not feasible unless they actually participate to the extent that under USA patent law they would be recognized as an inventor. There are, however, many other ways to ensure an interest in patent royalties than being listed as an 'inventor'.

The NCI provides the contractors with the NCI LOC (available at http://ttb.nci.nih.gov/nploc.html and reprinted here as Appendix A) for transmission to the appropriate authorities and scientific organizations (Mays *et al.* 1997). The LOC states NCI's willingness to collaborate with local scientists or authorities in the discovery and development of novel drugs from organisms (plants, marine invertebrates, or microbes) collected in their countries or territorial waters, and, if requested, the NCI will enter into formal agreements based on the LOC with the relevant SCG agency or source-country organization (SCO). Appendix B lists countries which have collaborated with NCI in the collection of plants and marine organisms, both countries which have signed LOCs and those which have not, as yet, signed formal agreements with the NCI. However, in the latter case, since these countries are fully aware of the terms of the LOC, they granted the necessary permits for NCI con-

tractor activities without requiring a formal agreement. In this respect, the NCI is totally committed to the terms of the LOC irrespective of whether or not a formal agreement has been signed. This commitment was confirmed in a letter to the Editor of the Botany 2000-ASIA Newsletter from the then Deputy Director of the NCI Division of Cancer Treatment (Kaufman 1993), and has also been stated in presentations by NCI Natural Products Branch (NPB) staff in many forums worldwide.

The feasibility of conducting collection contract activities has been affected as countries have started to formulate and implement access policies. In certain instances, such as in the Philippines with the introduction of Executive Order 247 (EO247), collection programs have had to be terminated due to the complexity of the permit application process. There are, however, indications that the EO247 policies are being reconsidered and modified to simplify the process and facilitate access by bona fide organizations (Benevidez II 2004). In other instances, collections have been temporarily suspended while policies have been implemented. An example has been the case of Papua New Guinea where a regulatory body, the Papua New Guinea Institute of Biodiversity Network (PNGBIONET), has been established to review all applications for collection permits. If the applicant is considered acceptable, PNGBIONET designates a local organization to work with the applicant and formulate a collaborative agreement ensuring appropriate terms of training, technology transfer, and benefit sharing.

In 2001, the NCI signed LOC- and Memoranda of Understanding (MoU)-based agreements with the University of Papua New Guinea and collections are proceeding once more. It is interesting that NCI NPB staff have been regularly consulted, not only by the scientific and regulatory communities in Papua New Guinea, but by similar communities in other countries seeking guidance in formulating appropriate access and collaborative policies.

6.1.2 NCI interactions with source-country representatives

As stated above, several source countries have participated in the NCI contract collection programs without formally entering into LOC-based agreements with the NCI. The reasons for not requiring a formal agreement were not stated, but it is possible that the particular source country had not formulated official access policies at the time of the collections, but accepted the terms of the LOC 'in good faith' or, as in the case of a number of Commonwealth countries or countries whose political system evolved from the British Empire rather than from the USA or European models, there often is no formal entity that has authority over all lands and seas and therefore may sign such a document.

This absence of formal agreements has not been due to lack of effort on the part of the NCI contractors or NPB staff to solicit formal agreements from the source countries involved. Indeed, NPB staff has interacted with SCG representatives and scientists, both in their countries, or more frequently during NCI-sponsored visits to NCI and contractor USA-based home facilities. The purpose of these visits is to provide opportunities for source-country officials and scientists from SCOs to observe the NCI drug-discovery facilities and the processes to which their raw materials are subjected, and to discuss collaboration in the drug-discovery process. A list of over 65 source-country officials and scientists, who have visited NCI, to discuss either participation in NCI contract collections or direct collaboration in the drug-discovery process, is given in Appendix C. However, as mentioned earlier, it should be stressed that NCI is totally committed to the terms of the LOC irrespective of whether or not a formal agreement has been signed with a source country participating in contract collections.

6.1.3 Collection specifications: Conservation and sustainable use

The opening paragraph of the LOC states: 'While investigating the potential of natural products in drug discovery and development, NCI wishes to promote the conservation and sustainable utility of biological diversity, …' (Appendix A). This commitment to conservation is also a condition of an award of an NCI collection contract. Would-be contractors receive specific instructions in the NCI Request for Proposals (RFP): 'Endangered species listed by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

must not be collected, and sound environmental practices should be exercised.'

Collection contractors are requested to refer to literature on the medicinal use of plants and other organisms found in their regions of collection, and, where feasible, to consult with local healers concerning the use of medicinal plants and their method of preparation, as a guide to the collection of species of interest. This is also alluded to in the LOC (Role of SCG/SCO, clause 2), and the LOC states that all information will be kept confidential, with publication of such information being contingent on permission being granted by the traditional healer or community, and with proper acknowledgment being made for their contribution. The main goal of the NCI, however, is to collect species from as wide a variety of families and genera as possible, with avoidance of the collection of too many species from one family to the exclusion of species from other families of interest. The NCI recognizes that cancer is not likely to be a major health concern of indigenous communities which are more focused on the treatment of devastating parasitic diseases such as malaria, resulting in the predominant identification of local plants and other organisms having efficacy against these diseases.

The advanced development of a potential drug from plant or marine sources generally is going to require the re-collection of large quantities of the source raw material for production of sufficient drug for preclinical and clinical development. While the total synthesis of the drug may be possible, the structural and stereochemical complexity of most naturally derived drugs often precluded the development of economically feasible large-scale total syntheses, though with advances in methodology in the 2001-date time frame, this may well be a favorable route for some molecules. Semi-syntheses from natural precursors are applied in certain cases, e.g., the conversion of baccatin III derivatives isolated from *Taxus baccata* to Taxol® and the synthesis of Yondelis® from bacterially sourced cyanocycline B. The NCI requires that a thorough survey of the abundance, range and distribution of the source organism be undertaken as a prelude to any large-scale collection (LOC, Role of SCG/SCO, clause 4). Such surveys are done in close collaboration with the local authorities and populations and only in instances where sustainable harvest is assured will extensive collections be approved. Significant examples of this policy were the isolation of the potential anti-HIV agent, (-)-calanolide B, from the latex of the plant *Calophyllum teysmanii* and the purification of halichondrin B from large-scale harvesting of the marine sponge, *Lyssodendoryx* species, from New Zealand waters (*see* case studies, below).

Where sustainable harvest from the wild is not considered possible, the feasibility of mass propagation of the organism in the source country is explored. This was undertaken in the production of the potential anti-HIV agent, michellamine B, from the Cameroon plant *Ancistrocladus korupensis* (*see* case study, below). Again, the local authorities and population were closely involved with the project.

6.1.4 Source-country collaboration

In carrying out these collections, the NCI contractors work closely with qualified organizations in each of the source countries. Botanists and marine biologists from SCOs collaborate in field collection activities and taxonomic identifications, and their knowledge of local species and conditions is indispensable to the success of the NCI collection operations. When necessary and relevant, SCOs provide facilities for the preparation, packaging and shipment of the samples to the NCI's Natural Products Repository (NPR) in Frederick, MD USA.

In a significant number of cases, these interactions materially aid the procurement of both the initial collection permits and most importantly, the specific export documentation required by the country of origin. There is another important point as well that needs to be emphasized here and that is that all collections are imported into the USA against specific Department of Agriculture (USDA) and Fish and Wildlife Service (FWS) permits held by the NPB as the NCI representative.

The collaboration between the SCOs and the NCI collection contractors, in turn, provides support for expanded research activities by source-country biologists. The deposition of a voucher specimen of each species collected in the national herbarium or repository is expanding source-country holdings of their biota. (*See* Box 1 for potential complications in identifying the source

organism.) NCI contractors also provide training opportunities for local personnel through conducting workshops and presentation of lectures, both in-country and at the contractor's USA facilities. As an example, during the contract cycle from 1996 to 2001, MBG offered one-month curatorial workshops at their facilities in St. Louis, MO USA in May 1999 and March 2001. Through its contract with MBG, the NCI supported the attendance of seven botanists from Madagascar, Ghana, Tanzania, and Zambia, and participants were instructed in collections management, botanical research methodology, biodiscovery, conservation and global information systems.

In addition, through its LOC (Appendix A) and agreements based upon it, the NCI invites scientists nominated by SCOs to visit its facilities, or equivalent facilities in other approved USA organizations, for 1 to 12 months to participate in collaborative natural products research involving the screening and bioassay-directed fractionation of extracts. (LOC, Role of DTP/DCTD/NCI, clauses 4 and 5). Twenty-two such visits have been sponsored since 1990, and the scientists involved are listed in Appendix D.

Box 1 Problems with Sample Identity: Who is Actually Producing the Metabolite?

Since the introduction of the taxonomic binomial system by Linnaeus, a major part of any collection program has been the identification of the 'nominal' producing organism by suitably qualified taxonomists; experts in that particular niche of organisms from which the compound(s) of interest have been isolated. The discussion in this section will only deal with plants, marine invertebrates, and microbes.

Over the last fifty or so years, in addition to the classical methods of direct observation of morphological characteristics of an organism, there has grown up the subdiscipline of 'chemotaxonomy' whereby the chemical products of an organism have been used as one (and in some cases, the major) determinant of a particular genus or species when closely related organisms have been investigated. Until recently, such determinations were usually accepted without much question and led to the derivation of lists of chemical structures that were considered to be plant metabolites from genus 'X' and species 'Y'. Similar statements were made about marine algal products, particularly halogenated terpenoids.

However, from experimental evidence, initially amassed from both marine and microbial sources over the last decade and then moving into the plant arena, these relationships are now being questioned. In a number of very prominent cases, the actual source of important secondary metabolites are being questioned, analyzed, and revised. This has come about as a result of the ability to perform very sophisticated analyses of the genomes of the organisms in question. Some examples that will demonstrate the very rapid advances in the application of genomics to such questions, albeit initially in an indirect manner, are as follows.

- Maytansine has been identified as a predominately microbial product (ansamitocin P3) that is probably adsorbed by the *Maytanus* species from the rhizosphere of which it was originally isolated (Yu and Floss 2005).

- Endophytic fungi have been isolated from plants from which camptothecin (Puri *et al.* 2005) and podophyllotoxin (Eyberger *et al.* 2006) are isolated. These fungi will produce these very important compounds when fermented in a laboratory setting in the absence of any plant extracts and at levels above those possible from 'carry-over' during the fungal isolations.

- Taxol® has been reportedly produced by various different fungi isolated from a large variety of trees. These reports were almost always ignored as the isolated fungi would not produce any significant amounts of

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the metabolite when placed in fermentors (Strobel *et al.* 2004). The comments below on the work by Bok should be considered whenever comments are made on the 'lack of production' by isolated microbes.

- The peptidic patellamides were produced by two independent groups from a marine invertebrate. In one case, the gene cluster was isolated from the commensal *Prochloron* species and then the genes were cloned into *Escherichia coli* from which the metabolites were subsequently expressed (Schmidt *et al.* 2005). The other group shotgun-cloned the whole genome of the corresponding *Prochloron* species into *E. coli* and then achieved expression of the same metabolites (Long *et al.* 2005).

- Similarly, the genes coding for the cytotoxic onnamides were isolated from the producing sponge by using gene probes for the producing cluster, that were originally derived from work with the commensal pseudomonad that produced the closely related insect toxin, pederine (Piel *et al.* 2004).

These are only a very few of the examples that are now beginning to challenge existing answers to the question '*who or what is the producing organism for a given compound or compound class*?' If one begins to probe further, then it is becoming obvious that the most biodiversity is not in the plant, marine invertebrate, or even the insect arena, but in the microbes (either individual or as consortia) that are part of the ecosystems surrounding the larger organism.

This realization is something that is going to have to be factored into any discussion as to the *value of a given organism*. A major confounding factor is the burgeoning ability to be able to *mix and match* the producing gene clusters of microbes so that compounds that have not been, nor would have been, seen by any normal extraction process, may now be made in a laboratory setting. What is even more interesting scientifically, is the realization, brought about by the ability to sequence organisms ever more cheaply and rapidly, that even extremely well-studied streptomycetes such as *Streptomyces coelicolor* (which can be thought of as the *E. coli* K12 of the streptomycetes, has been shown, once the whole genomic sequence was determined, to have at least a dozen or more potential antibiotic-producing clusters, of which only a handful had ever been expressed prior to that time.

Since then, and it is less than five years ago, workers have shown that in all of the actinomycetes that they have looked at, and these now number over 100, an average of ten previously unrecognized, and hence unexpressed clusters, have been found (McAlpine *et al.* 2005). Work is actively going on in finding ways of expressing such gene clusters, either in the parental strain or in a surrogate host, in order to produce these novel metabolites, and if the earlier productivity of these organisms is anything to go by, we are on the cusp of many novel discoveries from these techniques.

Such discoveries are not only in the well-known bacterial genera, but are also being found in the fungi. Originally, then-current dogma had it that the secondary metabolite-producing clusters were not grouped as in the bacteria, but were spread throughout the genome. However, current work indicates that this is not the case. Only the primary metabolic clusters are spread throughout the genome, the secondary metabolic clusters can be found and analyzed in a manner similar to those used in the actinomycetes (Bok *et al.* 2006).

As a result of these discoveries, it now may well become extremely difficult to follow the trail of a given producing organism, particularly since the actual producer may well be commensal or epiphytic microbes that cannot be detected except in well-equipped laboratories with available experts in genomic techniques. Although there are analytical systems that might be able to differentiate between microorganisms of similar taxonomy but of different strain lineages, such techniques are currently only available in a very few laboratories, all in developed nations. Suitable safeguards will have to be developed, but current practice may have to rely on trust.

The LOC also dictates benefit sharing and use of source-country resources in the event of the licensing and development of a promising drug candidate (LOC, Role of DTP/DCTD/NCI, clauses 8-10). Successful licensees are required to negotiate agreements with SCG agencies or SCOs dictating terms of collaboration and compensation. The terms apply irrespective of whether the potential drug is the actual natural isolate or a product structurally based upon the isolate, a synthetic material for which the natural product material provided a key development lead, or a method of synthesis or use of any aforementioned isolate, product, or material; though the percentage of royalties negotiated as payment might vary depending upon the relationship of the marketed drug to the originally isolated product. The first milestone in the licensing agreement is that a signed agreement must be presented to the NIH's Office of Technology Transfer (OTT; the group within NIH that formally licenses all NIH patents) within one year of the initial granting of the license.

As mentioned earlier, the original formulation of the NCI policies for collaboration and compensation embodied in the LOC predated the drafting of the CBD (http://www.biodiv.org/convention/articles.asp) by at least four years with the first agreement being one signed by the Malagasy Republic in 1990. No changes in the LOC have arisen as a result of the CBD.

6.2 Sample volumes and initial processing

One of the scientific precepts underlying the new collection program (i.e., post-1985) was that enough natural product materials should be collected in the initial collection, subject to environmental concerns, for the chemical identity of any active agent to be determined without having to perform a re-collection. This was a lesson learned from the earlier program where frequent and sometimes unsuccessful re-collections had to be made due to an inability to determine the actual structure of the active principles with the amount of materials in hand. With the advent of newer isolation and instrumental techniques, the decision was made to collect approximately 1 kilogram (dry weight) of plant materials and 1 kilogram (frozen wet weight) of marine invertebrates and algae.

A frequent question about NCI's processes is 'what about unstable chemical compounds, aren't you worried about decomposition and loss of activity?' The answer is that unstable chemical entities are interesting scientifically but of little-to-no value in developing drug leads. Therefore a usable and repeatable system was devised and tested by performing various extraction techniques on plant and marine organisms known to produce agents of value and adjusting our methods until they could be found.

These samples, previously shipped to the NPR in Frederick and stored at -20°C until workup, are converted to dry or wet powders prior to sequential extraction with a 1:1 mixture of methanol:dichloromethane (organic) and water (aqueous) extracts, with full details given at http://npsg.ncifcrf.gov/. All extracts are assigned unique, confidential NCI numbers and returned to the NPR for storage at -20°C until requested for screening or further investigation. After testing in the then current *in vitro* human cancer cell line screen (http://dtp.nci.nih.gov/branches/btb/ivclsp.html), active extracts are subjected to bioassay-guided fractionation to isolate and characterize the pure, active constituents. Agents showing significant activity in the primary *in vitro* screens are selected for secondary testing in several *in vivo* systems, starting with the 'hollow fiber assay' (Hollingshead *et al.* 1995). Those agents exhibiting significant *in vivo* activity are considered for advancement into preclinical and clinical development.

6.3 Distribution of extracts from the NCI natural products repository material transfer agreements (NPR-MTA)

As a result of the initial antitumor assays that were run, it was rapidly realized that the rate-limiting step was the isolation and identification of active principles from the extracts that were produced and considered to be 'active'. In addition, there were a very large number of extracts, both aqueous and organic, that demonstrated a range of activities from none to extremely cytotoxic but were not selective against the human cell lines. In order to maxi-

mize the potential of these extracts and also to aid the source countries, early on in the process (effectively from the end of 1991) NCI began to permit research groups in the USA and their collaborators to access samples from the NPR, initially for antitumor work since, due to the rapid progress made in the elucidation of mechanisms underlying human diseases, a proliferation of molecular targets available for potential drug treatments became candidates for assays. The adaptation of these targets to high-throughput screening processes has greatly expanded the potential for drug discovery using the NPR extracts as input to assays against any disease of interest to the NIH. However, a small subset of materials in which NCI had interests as potential sources of novel antitumor agents were reserved for antitumor work only.

In carrying out this program (http://dtp.nci.nih.gov/branches/npb/repository.html), the NCI developed policies for the distribution of extracts from the NPR to qualified organizations for testing initially in screens related to cancer and HIV and subsequently in screens related to all human diseases, subject to the signing of a legally binding material transfer agreement (MTA) which protects the rights of all parties (http://dtp.nci.nih.gov/branches/npb/agreements.html). The key term of the MTA is the requirement that the recipient organization negotiate agreements stipulating suitable terms of collaboration and compensation with the source country(ies) of any extract(s) which yields agents which are developed towards clinical trials and possible commercialization.

Such terms would follow those stipulated by the NCI LOC and would apply even if no formal LOC-based agreement had previously been signed between the source country and the NCI. This agreement relating to the agent is to be binding upon SCO, recipient, and any licensee(s) or assignees of the recipient with respect to any intellectual property rights relating to the agent, and, similarly to the LOC, if semi-synthetic or synthetic derivatives are utilized, then they would also have similar rights but the levels of royalties etc., would be lower for obvious reasons. The overall process also included a mechanism whereby the source country could receive a proportion of its samples of extracts made from materials collected within its borders/territorial waters/economic exclusion zone free of charge for purposes of in-country research or distribution to its collaborators under whatever conditions the source country might decide.

6.4 Direct collaboration with source-country organizations: The NCI Memorandum of Understanding

As discussed above, the collections of plants and marine organisms have been carried out in over 25 countries through contracts with qualified botanical and marine biological organizations working in close collaboration with qualified SCOs, and all collections are performed subject to the terms of the LOC. Particularly in the area of plant-related studies, source-country scientists and governments are becoming increasingly committed to performing more of the drug-discovery operations in-country, as opposed to the export of raw materials. The NCI has recognized this fact for several years, and contract collections of plants have been de-emphasized in favor of establishing direct collaborations with qualified organizations in the source countries where the necessary expertise and infrastructure exist.

The NCI has negotiated MoUs (http://ttb.nci.nih.gov/npmou.html and reprinted as Appendix E) with over 20 SCOs suitably qualified to perform in-country processing (Appendix F). In establishing these agreements, NCI undertakes to abide by the same policies of collaboration and compensation as specified in the LOC. Depending on the availability of the necessary resources NCI also assists the SCOs in establishing their own drug-discovery programs through training in techniques of antitumor screening and natural product isolation. NCI has sponsored long-term visitors from 18 countries since 1988 for purposes of such collaboration and training (Appendix G).

It is anticipated that the discovery of novel anticancer drugs will be performed by SCOs at their own expense, with assistance from the NCI in terms of secondary *in vitro* and *in vivo* testing. All results from such secondary testing would be considered the sole intellectual property of the SCO (the NCI regards such testing as a routine service to the scientific community), and can be used by the SCO in the application for patents covering sufficiently promising inventions. The NCI will devote its resources to collaborating with SCOs in the preclinical and clinical development of any SCO-discovered drug which meets the NCI selection criteria and will make a

sincere effort to transfer any knowledge, expertise, and technology developed during such collaboration to the SCO, subject to the provision of mutually acceptable guarantees for the protection of intellectual property associated with any patented technology.

An excellent illustration of the potential benefits of such collaborations is the MoU signed with the Universidade Federal do Ceara in Fortaleza, Brazil. Through this collaborative agreement, scientists from this university (*see* Appendix G) received training in the methodology used by NCI in the *in vitro* testing of samples in the human cancer cell line prescreen and 60 cell line screen (http://dtp.nci.nih.gov/branches/btb/ivclsp.html), and a screen was established at the university with cell lines provided by NCI. The university has established collaborations with drug-discovery groups involved in both natural products isolation and synthetic studies throughout Brazil, and the potential of the immense biodiversity of Brazil is now being explored in-country. Any novel antitumor agents (pure compounds) discovered through this in-country collaborative network can be submitted to the NCI for free secondary *in vitro* and *in vivo* evaluation, and those agents meeting the NCI selection criteria may be advanced into preclinical and clinical studies using the NCI resources and involving true collaboration between the Brazilian investigators and the NCI.

Promising discoveries may be patented by the Brazilian inventors prior to advanced development, thereby ensuring that they have control over any subsequent licensing negotiations which may result should the agent advance to the stage where pharmaceutical company interest is stimulated. Such mechanisms ensure that optimum value is added to discoveries emerging from source-country genetic diversity, and that the source country derives optimal value in terms of subsequent benefits which may result, such as milestone payments, technology transfer, and royalty payments. These aspects are discussed in more detail below in the conclusions and recommendations. Through this mechanism collaborations have been established with 23 organizations in 11 countries (Appendix F).

6.5 Technology transfer

In the second paragraph of the LOC (Appendix A) and similarly in the second paragraph of the MoU (Appendix E), the NCI states that it 'will make sincere efforts to transfer knowledge, expertise, and technology related to drug discovery and development to the [appropriate Source Country Institution ('SCI')] in [Source Country] as the agent appointed by the [SCG or SCO], subject to the provision of mutually acceptable guarantees for the protection of intellectual property associated with any patented technology'. This commitment is repeated in DTP/DCTD/NCI role, clause 5, of the LOC.

Through its sponsorship of visits by source-country scientists to NCI or other equivalent USA facilities mutually acceptable to NCI and the source-country authorities (*see* Appendices D and G for lists of long-term visiting scientists), the NCI has provided substantial training and expertise to these visiting scientists in the methodology used in the screening and bioassay-guided fractionation of extracts of organisms collected in their countries. In most instances, the NCI has covered the full expenses of such visits, including travel and subsistence, though there have been a few cases where the collaborating SCO has paid for the travel and subsistence, with the NCI covering all the laboratory and associated costs.

Where suitable infrastructure is available at source-country institutions and NCI resources are available, the NCI will provide human cancer cell lines, as well as the appropriate cell line and virus (genetically modified to be non-infectious) for a cell-based anti-HIV screen, to those institutions to enable them to set up screens for their own in-house drug-discovery programs. This has been implemented in institutions in Brazil, China, Egypt, India, Korea, Malaysia (Sarawak and Peninsular), Mexico, Pakistan, Panama, Philippines, Russia, South Africa, Thailand, and Zimbabwe. In addition, computer software for the tracking of the collection, extraction, screening, and fractionation of natural materials is available free of charge. The NCI is not permitted to provide funding for the establishment and equipping of laboratories, but institutions may apply for support from other USA government agencies such as the Agency for International Development (USAID). Through its collection contractors, however, the NCI has assisted in the renovation and equipping (computers and herbarium cabinets) of source-country herbaria in countries who have partici-

pated in some of the collection programs.

It should be noted that substantial support for source-country operations is also provided through NCI-funded USA grantee programs in instances where the grantees have collaborations with appropriate SCOs (Suffness *et al.* 1995). Since grantee research is regarded as independent, collaborating institutions in source countries may receive support from the grantee in the form of equipment and materials in addition to training, and in particular, grantee institutions may sign collection agreements that include royalty and other commitment statements that the USA Government is forbidden to sign. Such an example is the 'commercial' agreement signed by the University of Utah and the University of the Philippines permitting collection work on Philippines-sourced marine invertebrates.

6.6 Case studies: Anti-HIV agents

From 1987 to 1996, the NCI tested over 30,000 plant extracts in an *in vitro* cell-based anti-HIV screen which determined the degree of HIV-1 replication in treated infected lymphoblastic cells versus that in untreated infected control cells. Several natural products have shown *in vitro* activity (http://www.niaid.nih.gov/daids/dtpdb/natprod.html), and the development of three of them is discussed below.

6.6.1 Michellamine B: A potential anti-HIV agent from the Cameroon Liana, *Ancistrocladus korupensis*

Michellamine B was isolated as the main *in vitro* active anti-HIV agent from the leaves of this liana, collected in the Korup region of southwest Cameroon through an NCI contract with MBG (Boyd *et al.* 1994). *Ancistrocladus korupensis* is a new species (Thomas and Gereau 1993), found only in and around the Korup National Park, and vine densities are very low, on the order of one large vine per hectare. While fallen leaves do contain michellamine B, and their collection provided sufficient biomass for the isolation of enough pure compound to complete preclinical development, it was clear that extensive collections of fresh leaves could pose a possible threat to the limited and sparse wild population.

Thus far, no other *Ancistrocladus* species has been found to contain michellamine B. Investigation of the feasibility of cultivation of the plant as a reliable biomass source was initiated in 1993 through a contract with the Center for New Crops and Plant Products of Purdue University working in close collaboration with the University of Yaounde 1 in Cameroon, the World Wide Fund for Nature Korup Project, MBG, Oregon State University, and the NCI-Frederick contractor, Science Applications International Corporation (SAIC). Initially, an LOC-based agreement was signed with the University of Yaounde 1, but this was abrogated by the Cameroon Government when it established a special committee to oversee the collection and cultivation operations. Despite extensive interaction and collaboration between this special committee and the NCI, and the consortium of organizations involved in the cultivation project, no formal agreement was finalized between the Cameroon Government and the NCI.

An extensive botanical survey was undertaken, the range and distribution of the species were mapped, and dried leaves were analyzed for michellamine B content. Promising plants were re-sampled for confirmatory analysis, and those showing repeated high concentrations were targeted for vegetative propagation. A medicinal plant nursery was established for the *A. korupensis* collection near Korup Park Headquarters in Mundemba, and through selection of promising plants from the wild and their subsequent propagation and growth in the nursery, it was demonstrated that michellamine content well above the wild average could be produced routinely (J. Simon, pers. comm., 1995). In keeping with the NCI policies of collaboration with source countries, all the cultivation studies were performed in Cameroon, and involved the local population, particularly those in the Korup region where the plant was originally discovered.

Based on the observed activity and the efficient formulation of the diacetate salt, the NCI committed michellamine B to initial new drug application (INDA)-directed preclinical development, but continuous infusion studies in dogs indicated that *in vivo* effective anti-HIV concentrations could only be achieved at close to neuro-

toxic dose levels. Thus, despite *in-vitro* activity against an impressive range of HIV-1 and HIV-2 strains, the difference between the toxic dose level and the anticipated level required for effective antiviral activity was small, and NCI decided to discontinue further studies aimed at clinical development. However, the discovery of novel antimalarial agents, the korupensamines, from the same species (Hallock *et al.* 1994) adds further potential for this species. This project has been reviewed as a 'Benefit-Sharing Case Study' for the Executive Secretary of the CBD by Laird and Lisinge (1998).

6.6.2 The Calanolides: Potential anti-HIV agents from *Calophyllum* species, Sarawak, Malaysia

An extract of the leaves and twigs of the tree, *C. lanigerum*, collected in Sarawak, Malaysia in 1987, yielded (+)- calanolide A which showed significant anti-HIV activity (Kashman *et al.* 1992). Efforts to relocate the original tree failed, and collections of other specimens of the same species gave only trace amounts of calanolide A. A detailed survey of *C. lanigerum* and related species discovered that latex of *C. teysmanii* yielded extracts with significant anti-HIV activity. The active constituent was found to be an isomer, (-)-calanolide B, which was isolated in yields of 20 to 30%. While (-)-calanolide B is slightly less active than (+)-calanolide A, it has the advantage of being readily available from the latex which is tapped in a sustainable manner by making small slash wounds in the bark of mature trees without causing any harm to the trees. The calanolides were licensed by NCI/NIH to Medichem Research, Inc., (now Advanced Life Sciences) which, as required by the NCI LOC (Mays *et al.* 1997), negotiated an agreement with the Sarawak State Government. The drugs are being developed by Sarawak Medichem Pharmaceuticals, a joint venture company formed between the Sarawak State Government and Medichem Research, Inc. Medichem Research had synthesized (+)-calanolide A and it is currently headed for Phase II clinical trials, while (-)-calanolide B is in preclinical development. Fairly recently, a report from Mexico identified a plant producing both calanolides A & B and also the closely related compound sulattrolide, thus demonstrating the potential for the production by agricultural means of both of the compounds (Huerta-Reyes *et al.* 2004). The earlier development of the calanolides has been reviewed as a 'Benefit-Sharing Case Study' for the Executive Secretary of the CBD by staff of the Royal Botanic Gardens, Kew UK (ten Kate and Wells 1998).

6.6.3 Prostratin: A potential anti-HIV agent from *Homalanthus nutans*, American Samoa

Prostratin, a previously known compound, was isolated as the active constituent from an extract of the wood of the tree, *H. nutans*. (Gustafson *et al.* 1992). The plant was identified by Dr. Paul Cox (then at Brigham Young University) as being used for the treatment of yellow fever (subsequently identified as hepatitis) based on interviews with traditional healers in Samoa conducted under terms of a covenant negotiated between Brigham Young University and the chiefs and orators in the village of Falealupo in Samoa, and with the concurrence of the Samoan Prime Minister and members of parliament (Cox 2001). Under the covenant, over $480,000 has been supplied to the village for schools, medical clinics, water supplies, trails, an aerial rain forest canopy walkway, and an endowment for the rain forest.

Subsequent studies determined that prostratin is a potent activator of HIV expression in latently infected T-cell lines, (Gulakowski *et al.* 1997) and its potential value in HIV therapy lies more in its possible utility as a viral activator for use in highly active anti-retroviral therapy (HAART) techniques, rather than as an anti-HIV agent. The further development of prostratin is being undertaken by the AIDS ReSearch Alliance of America (ARA; http://www.aidsresearch.org/) (supported by the NCI and the National Institute for Allergy and Infectious Diseases) which has negotiated an agreement with the government of Samoa allowing for benchmark payments to the government of Samoa, the village, and the families of the healers. In addition, ARA will endeavor to obtain prostratin from Samoan plant sources as long as it can be produced in a cost-effective manner, and will strive to ensure that the drug will be distributed at minimal profit in developing nations where use of the drug is approved.

6.7 Case study: Anti-cancer agent

6.7.1 Halichondrin B from the New Zealand marine sponge, *Lyssodendoryx* species

An example from the marine area is the preclinical development of the potential anticancer agent, halichondrin B. This compound was originally reported by Japanese investigators in 1986 but the supply was extremely limited. Following work by NCI scientists using materials provided by Dr. G.R. Pettit, which demonstrated that halichondrin B was a tubulin-interactive agent binding at a nontaxoid site on tubulin (Bai *et al.* 1991), together with some preliminary preclinical data, NCI decided to further develop this agent. This led to a search for a source and following reports from the New Zealand marine natural product chemists, Drs. John Blunt and Murray Munro of the University of Canterbury, a *Lissodendoryx* sponge was identified as a potential source, found at depths in excess of 100 meters off the east coast of New Zealand's South Island.

Over the next five years, commencing with an NCI-funded environmental assessment of the potential sponge bed, performed in collaboration with the New Zealand National Institute for Water and Atmospheric Research (NIWA), the government of New Zealand issued a collection permit for up to 1 metric ton of sponge to be harvested by dredging from the estimated total of 16 metric tons on the shelf at roughly 100 to 150 meters depth. A joint venture company was set up by NIWA and the University of Canterbury to perform this work. With the prior approval of the local indigenous Iwi (Maori tribal leaders), the collections began. Following the expenditure of approximately US$250,000 by the NCI and a comparable sum (in kind) from the government of New Zealand, a sufficient quantity (300mg from 1,000kg wet sponge) for limited further development was obtained and shipped to NCI for further work.

Since NCI had had extensive prior experience of the problems associated with large-scale recovery of biomass from the beginning (particularly the search for *Taxus* species in the previous five or so years), methods that might lead to production of biomass without resorting to dredging were investigated. NCI therefore separately funded a considerable amount of work on the in-sea aquaculture of the *Lissodendoryx* sponge in various areas of New Zealand with the aim of achieving both sponge growth and production of the halichondrins. As a result of this collaborative study we demonstrated that this deep-water sponge could be successfully grown at depths as shallow as 10 meters while still producing amounts of halichondrin B comparable to those found in the wild material (Munro *et al.* 1999).

Following extensive preclinical work by NCI with the New Zealand sample, halichondrin B was shown to exhibit *in vivo* efficacy in both early- and late-stage tumor models. However, we also compared its activity against a simpler analogue made by total synthesis under current good manufacturing practice (cGMP) conditions by the American subsidiary (The Eisai Research Institute) of the Japanese pharmaceutical company, Eisai, leading to the decision by NCI in July 2001 to recommend that their analogue, E7389, should go into Phase I clinical testing in humans. Currently this compound is now in Phase III clinical trials as a potential antitumor agent in refractory breast carcinoma. We should add, however, that the basis for the work by Eisai was from a collaboration with Professor Y. Kishi, an NCI-funded investigator at Harvard, who published the total synthesis of halichondrin B in 1992 (Aicher *et al.* 1992). This work and Kishi's discovery that the activity resided in the macrolide ring of halichondrin B led Eisai to license the Harvard patents and then to develop further the molecule leading to more stable and less toxic analogues, one of which is E7389, now in Phase II trials.

Since halichondrin B was first reported in 1986 by Japanese scientists from an Okinawan sponge, benefits from the development of the synthetic analogue will not flow back to the New Zealand groups, but these groups have been able to capitalize on the in-sea sponge aquaculture techniques and have a variety of sponges in aquaculture, including the peloruside-producing *Mycale* species (M. Page, pers. comm., 2004).

Conclusions

The early NCI plant-collection contractors (Missouri Botanical Garden, New York Botanical Garden, and the University of Illinois at Chicago) recommended that policies for equitable collaboration and benefit sharing with source countries be considered, and the NCI, NPB, and legal staff proceeded to formulate policies which were initially incorporated in the NCI LOC. These policies were initiated in 1988, four years prior to the signing of the CBD, and were revised and improved eventually to become the LOC. For further examples of the close relationships between the NCI, its plant collection contractors in particular, and source-country representatives, the reader should consult the reports presented at a conference (http://law.wustl.edu/centeris/index.asp?id=1836) on Biodiversity and Biotechnology and the Protection of Traditional Knowledge held in 2003 at the Washington University School of Law and in particular, the paper giving the MBG experiences working with Madagascar (Miller 2003).

It should be stressed that the evolution of the current LOC has been guided by productive interaction with source-country representatives with perhaps the most significant contribution (in 1993) from the then, and still current, Attorney-General of the State Government of Sarawak, Datuk J.C. Fong, who proposed that the DTP/DCTD/NCI role, clause 8 (involving the obligations of licensees of NCI-patented drugs that were discovered from organisms collected through the contract programs) be modified to require direct negotiation of terms of collaboration and benefit sharing between the licensees and the relevant source-country authorities. Before this modification, this term had stated: 'Should the agent eventually be licensed to a pharmaceutical company for production and marketing, DTP/NCI, in consultation with the SCO, will make its best effort to negotiate with the company for inclusion of terms in the licensing agreement requiring payment of a percentage of royalties accruing from sales of the drug to the Source Country Organization'. Constructive proposals such as this were, and continue to be, welcomed by the NCI which readily accepted Datuk Fong's proposal as being in the best interests of all parties.

The above instance of the modification of the LOC illustrates the importance of constructive interaction and discussions between source-country authorities (and scientists) and prospective users wishing to gain access to their genetic resources. Unfortunately, formulation of access policies without such consultation can lead to excessive regulation, complexity, and demands which deter potential users from even considering applying for access. On the other hand, constructive consultation also enlightens the potential users as to the legitimate claims and concerns of the source-country authorities, scientists, and indigenous communities. Failure to consider all aspects in a truly consultative, as opposed to confrontational, manner, creates a situation where all parties are the losers. As mentioned in the section on access to source-country resources, such a situation developed in the Philippines where some pharmaceutical companies refused to participate in any program which made use of materials from that country due to the demands of EO247. Unfortunately, this has also terminated the NCI collections in the Philippines despite the assurances given by an LOC-based agreement between the Philippines National Museum and the NCI, though as mentioned earlier, there are now indications that the EO247 system is undergoing revision.

The LOC effectively divides the biodiscovery (bioprospecting) process into two phases: The first phase involving the DTP/DCDT/NCI role, clauses A1-A6, can be regarded as basic research, in which many thousands of extracts are screened, and active extracts are subjected to bioassay-guided fractionation in an effort to identify lead compounds for development as a potential drug candidates. Clauses A1-A5 may involve the source-country scientists in collaborative research aimed at the discovery of novel agents through confidential exchange of results and other relevant data, training in screening, chemical isolation, purification, and structural elucidation techniques, and transfer of appropriate technology in these areas to the source country. Incorporation of clauses such as these enable source countries to enhance their drug-discovery capabilities and have been favorably received in the negotiation of agreements. This first phase, in which (at best) one in 4,000 to 5,000 extracts may yield a promising drug lead candidate, should be regarded as truly basic research, and should be subject to application for a basic research agreement (BRA), as opposed to a commercial research agreement (CRA). This would be the earliest stage at which applications for patent coverage may be filed for those leads exhibiting sufficient

promise. In such instances, a BRA must include mention of the absolute requirement for negotiation of a new agreement to cover the development of any promising drug candidate lead.

The second phase involves the preclinical development of the identified drug candidate, which if successful, permits the advancement of the drug to clinical trials after approval by the USA Food and Drug Administration (FDA) or an equivalent regulatory body in the source country. It is at this second phase that a compound may be considered to have possible commercial potential, even though commercialization is still fairly remote, and may take many years (5 to 10 or more) to achieve.

In the LOC, entry into this second phase triggers a new agreement between the licensee and appropriate SCG or SCO (DTP/DCTD/NCI role, clauses 8-11), which will determine appropriate terms of collaboration in the development process, sustainable and environmentally sound use of source-country resources in the production of the drug, and equitable sharing of benefits (e.g., milestone payments or eventual royalty payments if the drug ever reaches the commercialization stage).

The arguments favoring a two-phase process are bolstered by the NCI experience in the early years of its natural product drug and development program. From 1960 to 1982, some 35,000 plant samples (representing about 12,000 to 13,000 species) were processed to yield 114,000 extracts. Though a significant number of interesting active chemotypes were discovered, only two compounds advanced to the stage of development into commercial products. These were Taxol® (e.g., paclitaxel and its semi-synthetic analogue, docetaxel) and camptothecin, which, though it proved to be too toxic in clinical trials to become a commercial drug, has yielded commercial analogues, such as topotecan (Hycamptine®) and irinotecan (Camptosar®). One other product, homoharringtonine, remains in advanced clinical trials for treatment of refractory leukemias. Thus, 114,000 extracts derived from approximately 12,000 to 13,000 species gave only two compounds yielding products of commercial value (further derivatives and analogues of Taxol® and camptothecin are being developed, some of which will probably become commercial products).

The requirement for a CRA, incorporating terms spelling out benefits related to drug development and percentage royalty compensation, right from the start of a collaborative drug-discovery project, has a definite deterrent effect on potential users considering applying for access. Trying to address these issues for an as-yet-undiscovered product seems a pointless exercise, and could in fact result in the source country deriving lower levels of benefits in the long term.

Negotiation of such terms is best left to the second phase of the process when a promising drug candidate has been identified. At this stage, the terms of collaboration in the production and development of a fully characterized product, in particular, the breadth of any intellectual property determination (i.e., how broad a claim or claims can be made on the structure from a patent aspect?) with activity in a defined disease state having known market demands, as well as the appropriate levels of benefit sharing, can be rationally discussed, and a second agreement addressing the well-defined issues can be negotiated.

Another factor dampening the potential users' enthusiasm for applying for access is the requirement for them personally to negotiate terms of prior informed consent (PIC) with local communities and indigenous peoples. While most potential users are in complete agreement with the principles of PIC from relevant source-country stakeholders, the negotiations of the precise terms of PIC are best left to the collaborating source-country organizations and scientists. In this respect, the BRA should be required to incorporate participation of a qualified local organization which may collaborate in all aspects of the initial basic research, as is stipulated in DTP/DCTD/NCI role, clauses 1-6, of the NCI LOC.

The NCI has found that its collection contractors and their staff have excellent relationships with their source-country partners, and work with their partners to obtain all the necessary permits and PIC from the relevant government authorities and local communities. Collections are performed in collaboration with the local organizations, with the expenses of local scientists being fully covered by the NCI through the contract. As mentioned earlier in the section on source-country collaboration, the contractors also provide training and assistance

in the improvement of local herbaria. (However, *see* Box 1 for indications that the taxonomic identification of a plant may not be an identification of the source organism of a metabolite ostensibly isolated from that plant.) This close collaboration also extends to issues involved in development of promising candidates, such as large-scale cultivation and aquaculture projects (*see* the sections on collection specifications and case studies).

The NCI experience outlined above leads to the recommendations presented in the next section. Before proceeding with these recommendations, however, interested readers may wish to refer to a book discussing the regulatory atmosphere of 'bioprospecting' recently published under the auspices of the United Nations University by Gehl-Sampath (2005). This book discusses the various aspects of bioprospecting/biodiscovery from more economic and legal perspectives as opposed to the scientific and technological aspects.

Recommendations

Based on the NCI experience outlined in the previous sections, we recommend a two-phase approach to the exploration of source-country genetic resources as a source of potential novel drugs and other bioactive agents. For reference, the current versions of both the LOC and the MoU are attached as appendices A and E, respectively.

The first phase of the process should involve:

- Negotiation of a BRA with the relevant SCG department or agency, or with a qualified SCO selected by the government to represent its interests.
- The involvement of a suitably qualified local organization, if available, should be an essential requirement.
- The BRA should incorporate terms of collaboration as spelled out in DTP/DCTD/NCI role, clauses 1-6, of the NCI LOC (covering exchange of data, training, and technology transfer).
- There should be requirements for adequate protection of the environment and endangered species.
- Obtaining the PIC of relevant local stakeholders (e.g., indigenous peoples, local communities, and healers where appropriate) should be the responsibility of the local collaborating organization, or, if an SCO is not identified, the relevant SCG agency should assist in this process.
- The BRA should clearly require the negotiation of separate agreements covering any agents which are selected for Phase II development.

The second phase of the process once a drug lead candidate for preclinical development should trigger negotiations of a new agreement (the CRA) covering the specific issues related to the development and possible commercialization of the candidate. In addition, it is probable that the selection of an agent for Phase II development will have triggered submission of an application for patent coverage. However, it must be noted right from the start that the application for a patent and any subsequent issue of a patent is far removed from the possibility of commercialization. In fact, very few patented agents ever reach the stage of commercialization. Generally, from available data we estimate that less than four percent of patented pharmaceutical drug candidates actually become commercial drugs (Adams 1999) and even this figure is probably high.) The second phase should include:

- Terms of collaboration in the large-scale procurement of supplies of raw material for production of sufficient quantities of the drug candidate for preclinical and possible clinical development. Such terms should address environmental impact studies, the possibility of sustainable harvest, and the need for cultivation of the source organism. Local scientists and communities should be involved in these processes, as far as possible.
- Terms of collaboration in the production of the drug candidate (extraction, isolation, analysis, etc.), depending on the facilities and expertise existent in the source country and training and technology transfer where appropriate.
- Terms of collaboration and training in the preclinical aspects of the drug candidate (e.g., formulation, pharmacology).

In the last two points it must be noted that certain cGMP conditions (e.g., approved facilities) have to be met to satisfy the requirements of the FDA and equivalent reg-

ulatory bodies in other countries. These are extremely expensive conditions to fulfill, and generally these processes are best performed in the main user (developed) country.

- Terms of milestone payments at certain stages of development (e.g., FDA approval for entry into Phase I clinical trials, completion of Phase I clinical trials, etc.).
- Payment of percentage royalties on the sales of the drug, should it become commercialized, to an appropriate SCO or SCG agency as determined by the source country. (An attractive alternative to royalty percentage for a source country may be the provision of supplies of the drug free of charge for treatment of the local population, the provision of other drugs more useful to the source country, or the granting of a royalty-free license for production of the drug for use in the source country only.)

Appendix A.

LETTER OF COLLECTION AGREEMENT

between

[Source Country Institution]
and/or
[Source Country Organization]

and the

Developmental Therapeutics Program
Division of Cancer Treatment and Diagnosis
National Cancer Institute

The Developmental Therapeutics Program (DTP), Division of Cancer Treatment and Diagnosis ('DCTD'), National Cancer Institute (NCI) is currently investigating plants, micro-organisms, and marine macro-organisms as potential sources of novel anticancer drugs. The DTP is the drug discovery program of the NCI which is an Institute of the National Institutes of Health (NIH), an arm of the Department of Health and Human Services (DHHS) of the United States Government. While investigating the potential of natural products in drug discovery and development, NCI wishes to promote the conservation and sustainable utility of biological diversity, and recognizes the need to compensate [Source Country, SC] organizations and peoples in the event of commercialization of a drug developed from an organism collected within their country's borders.

As part of the drug discovery program, DTP has contracts with various organizations for the collection of plants, micro-organisms and marine macro-organisms worldwide. DTP has an interest in investigating plants, micro-organisms and marine macro-organisms from [Source Country], and wishes to collaborate with the [Source Country Government (SCG) or Source Country Organization(s) (SCO)] as appropriate in this investigation. The collection of plants, micro-organisms and marine macro-organisms will be within the framework of the collection contract between the NCI and the NCI Contractor [Contractor] which will collaborate with the appropriate agency in the [SCG or SCO]. The NCI will make sincere efforts to transfer knowledge, expertise, and technology related to drug discovery and development to the [appropriate Source Country Organization (SCO] in [Source Country] as the agent appointed by the [SCG or SCO], subject to the provision of mutually acceptable guarantees for the protection of intellectual property associated with any patented technology. The [SCG or SCO], in turn, desires to collaborate closely with the DTP/NCI in pursuit of the investigation of its plants, micro-organisms and marine macro-organisms, subject to the conditions and stipulations of this agreement.

A. The role of DTP, DCTD, NCI in the collaboration will include the following:

1) DTP/NCI will screen the extracts of all plants, micro-organisms and marine macro-organisms provided from [Source Country] for anticancer activity, and will provide the test results to [SCO] on an annual basis. Such results will be channeled via Contractor.

2) The parties will keep the test results and subsequently-developed data confidential until approved for publication by the parties. Before either party submits a paper or abstract containing test results for publication, the other party shall have 60 days to review and, as necessary file a sole or joint patent application in accordance with Article 6.

3) Any extracts exhibiting significant activity will be further studied by bioassay-guided fractionation in order to isolate the pure compounds(s) responsible for the observed activity. Since the relevant bioassays are only available at DTP/NCI, such fractionation will be carried out in DTP/NCI laboratories. A suitably qualified scientist designated by [SCO] may participate in this process subject to the terms stated in Article 4. In addition, in the course of the contract period, DTP/NCI will assist the [SCO], thereby assisting the [Source Country], to develop the capacity to undertake drug discovery and development, including capabilities for the screening and isolation of active compounds from plants, micro-organisms and marine organisms.

4) Subject to the provision that suitable laboratory space and other necessary resources are available, DTP/NCI agrees to invite a senior technician or scientist designated by [SCO] to work in the laboratories of DTP/NCI or, if the parties agree, in laboratories using technology which would be useful in furthering work under this agreement. The duration of such visits would not exceed one year except by prior agreement between [SCO] and DTP/NCI. The designated visiting scientist(s) will be subject to provisions usually governing Guest Researchers at NIH. Salary and other conditions of exchange will be negotiated in good faith. Costs and other conditions of visits will also be negotiated in good faith prior to the arrival of the visiting scientist(s).

5) In the event of the isolation of a promising agent from a plant, micro-organism or marine macro-organism collected in [Source Country], further development of the agent will be undertaken by DTP/NCI in collaboration with [SCO]. Once an active agent is approved by the DTP/NCI for preclinical development, [SCO] and the DTP/NCI will discuss participation by SCO scientists in the development of the specific agent.

   The DTP/NCI will make a sincere effort to transfer any knowledge, expertise, and technology developed during such collaboration in the discovery and development process to [SCO], subject to the provision of mutually acceptable guarantees for the protection of intellectual property associated with any patented technology.

6) DTP/NCI/NIH will, as appropriate, seek patent protection on all inventions developed under this agreement by DTP/NCI employees alone or by DTP/NCI and [SCG or SCO] employees jointly, and will seek appropriate protection abroad, including in [Source Country], if appropriate. All resulting patent applications and patents shall be assigned to the U.S. Department of Health and Human Services and managed by NIH. Under current NIH policy, all inventors of such assigned patents may receive royalties in accordance with said NIH policy for any royalty-bearing license(s) for these patent(s).

7) All licenses granted on any patents resulting from this collaboration shall contain a clause referring to this agreement and shall indicate that the licensee has been apprised of this agreement.

8) Should an agent derived from an organism collected under the terms of this agreement eventually be licensed to a pharmaceutical company for production and marketing, DTP/NCI will request that NIH/OTT require the successful licensee to negotiate and enter into agreement(s) with the appropriate [SCG] agency(ies) or [SCO] within twelve (12) months from the execution of said license. This agreement(s) will address the concern on the part of the [SCG or SCO] that pertinent agencies, institutions and/or persons receive royalties and other forms of compensation, as appropriate.

9) The terms of Article 8 shall apply equally to inventions directed to a direct isolate from a natural product material, a product structurally based upon an isolate from the natural product material, a synthetic material for which the natural product material provided a key development lead, or a method of synthesis or use of any aforementioned isolate, product or material; though the percentage of royalties negotiated as payment might vary depending upon the relationship of the marketed drug to the originally isolated product. It is understood that the eventual development of a drug to the stage of marketing is a long term process which may require 10-15 years.

10) In obtaining licensees, the DTP/NCI/NIH will require the license applicant to seek as its first source of supply the natural products from [Source Country]. If no appropriate licensee is found that will use natural products available from [Source Country], or if the [SCG] or [SCO] as appropriate, or its suppliers cannot provide adequate amounts of raw materials at a mutually agreeable fair price, the licensee will be required to pay to the [SCG] or [SCO] as appropriate, compensation (to be negotiated) to be used for expenses associated with cultivation of medicinal organisms that are endangered or for other appropriate conservation measures. These terms will also apply in the event that the licensee begins to market a synthetic material for which a material from [Source Country] provided a key development lead.

11) Article 10 shall not apply to organisms which are freely available from different countries (i.e., common weeds, agricultural crops, ornamental plants, fouling organisms) unless information indicating a particular use of the organism (e.g., medicinal, pesticidal) was provided by local residents to guide the collection of such an organism from [Source Country], or unless other justification acceptable to both the [SCG or SCO] and the DTP/NCI is provided. In the case where an organism is freely available from different countries, but a phenotype producing an active agent is found only in [Source Country], Article 10 shall apply.

12) DTP/NCI will test any pure compounds independently submitted by the [SCG or SCO] scientists for antitumor activity, provided such compounds have not been tested previously in the DTP/NCI screens. If significant antitumor activity is detected, further development of the compound may, as appropriate, be undertaken by DTP/NCI in consultation with the [SCG or SCO].

    Should an NCI/NIH patent on an agent derived from the submitted compound(s) eventually be licensed to a pharmaceutical company for production and marketing, DTP/NCI will request that NIH/OTT require the successful licensee to negotiate and enter into agreement(s) with the appropriate [SCG agency(ies) or SCO] within twelve (12) months from the execution of said license. This agreement will address the concern on the part of the [SCG or SCO] that pertinent agencies, institutions and/or persons receive royalties and other forms of compensation, as appropriate.

13) DTP/NCI may send selected samples to other organizations for investigation of their anti-cancer, anti-HIV or other therapeutic potential. Such samples will be restricted to those collected by NCI contractors unless specifically authorized by the [SCG or SCO]. Any organization receiving samples must agree to compensate the [SCG or SCO] and individuals, as appropriate, in the same fashion as described in Articles 8-10 above, notwithstanding anything to the contrary in Article 11.

B. The role of the Source Country Government ('SCG') or Source Country Organization(s) ('SCO') in the collaboration will include the following:

1) The appropriate agency in [SCG or SCO] will collaborate with Contractor in the collection of plants, micro-organisms and marine macro-organisms, and will work with Contractor to arrange the necessary permits to ensure the timely collection and export of materials to DTP/NCI.

2) Should the appropriate agency in [SCG or SCO] have any knowledge of the medicinal use of any plants, micro-organisms and marine macro-organisms by the local population or traditional healers, this information will be used to guide the collection of plants, micro-organisms or marine macro-organisms on a priority basis where possible. Details of the methods of administration (e.g., hot infusion, etc.) used by the traditional healers will be provided where applicable to enable suitable extracts to be made. All such information will be kept confidential by DTP/NCI until both parties agree to publication.

The permission of the traditional healer or community will be sought before publication of their information, and proper acknowledgment will be made of their contribution.

3) The appropriate agency in [SCG or SCO] and Contractor will collaborate in the provision of further quantities of active raw material if required for development studies.

4) In the event of large amounts of raw material being required for production, the appropriate agency of the [SCG or SCO] and Contractor will investigate the mass propagation of the material in [Source Country]. Consideration should also be given to sustainable harvest of the material while conserving the biological diversity of the region, and involvement of the local population in the planning and implementation stages.

5) [SCG or SCG] and SCO scientists and their collaborators may screen additional samples of the same raw materials for other biological activities and develop them for such purposes independently of this agreement.

This agreement shall be valid as of the date of the final authorized signature below for an initial period of five (5) years, after which it can be renewed by mutual agreement. It may be amended at any time subject to the written agreement of both parties. Copies of such amendments will be kept on file at both of the addresses indicated below.

For the National Cancer Institute:

_____

Name (typed):

Director, National Cancer Institute

_____

Date

mailing and contact address:

Technology Transfer Branch
National Cancer Institute at Frederick
Fairview Center, Suite 502
1003 - W. 7th Street
Frederick, Maryland 21701-8512 U.S.A.
Telephone: 301-846-5465
Facsimile: 301-846-6820

For [SCI] or [SCO]:

_____

Title:

_____

Date

mailing and contact address:

Appendix B. Source countries with which NCI has collaborated in the collection of plants and marine organisms

Collaborating countries with which NCI had a Letter of Collection agreement

Source country	Source county organization and date of agreement
Australia	Museum of the Northern Territories, 2002
Bangladesh	Bangladesh National Herbarium, Dhaka, 1994
Cambodia	Forest and Wildlife Research Institute, Department of Forestry and Wildlife, Phnom Penh, 2000
Ecuador	The AWA Peoples Federation, 1993
Gabon	Centre National de la Recherche Scientifique et Technologique (CENAREST), Libreville, 1993
Ghana	University of Ghana, Legon, 1993
Laos	Research Institute of Medicinal Plants, Ministry of Public Health, Vientiane, 1998
Madagascar	Centre National D'Applications des Recherches Pharmaceutiques, Antananarivo, 1990
Palau	Government of Palau, 2002
Papua New Guinea	University of Papua New Guinea, Port Moresby, 2001
Philippines	Philippines National Museum, Manila, 1992
Sarawak, Malaysia	State Government of Sarawak: State Department of Forests, 1994 Sarawak Biodiversity Council (Marine collections), 2002
Tanzania	Traditional Medicine Research Institute, Muhumbili University College of Health Sciences, University of Dar Es Salaam, 1991
Vietnam	Institute of Ecology and Biological Resources, National Center for Natural Science and Technology, Hanoi, 1997

Collaborating countries with which NCI did not have a Letter of Collection agreement

Bahrain	Dominican Republic	Malaysia	Paraguay
Belize	Federated States of Micronesia (Chuuk,Yap, etc.)	Maldives	Peru
Bolivia	Marshall Islands	St. Lucia	
Cameroon	Guatemala	Martinique	Thailand
Central African Republic	Guyana	Mauritius	Tonga
Colombia	Honduras	Nepal	
Dominica	Indonesia	Palau	

* NCI is totally committed to LOC terms of the irrespective of whether or not an official agreement has been signed.

Appendix C. Short-term (1 to 2 weeks) visitors to the USA sponsored by NCI

Year	Visitor	Institution*	Country†
1988	Dr. Elaine Elisabetsky	U. Federal do Para	Brazil
1989	Dr. Elimweka Mshiu	U. Dar Es Salaam	Tanzania
	Dr. Johnson Jato	U. Yaounde 1	Cameroon
	Dr. Robodo Andriantsiferana	CNARP	Madagascar
	Dr. Feetham Banyikwa	U. Dar Es Salaam	Tanzania
	Dr. Patricio Mena	Pontificia Univ. Catolica, Quito	Ecuador
1990	Dr. Ricardo Callejas	U. Antioquia, Medellin	Colombia
	Dr. Pei Sheng-ji	Kunming Inst. Botany	China
	Dr. Won S. Woo	Seoul National U.	S. Korea
	Dr. Twee Hormchung	Srinakharinwirot U.	Thailand
	Dr. Rama Rao	Univ. Hyerabad	India
	Dr. Rachel Trabjer	Sao Paulo State Govt.	Brazil
	Dr. Domingo Madulid	National Museum	Philippines
	Dr. C. V. Subramanian	Central Inst. For Medicinal and Aromatic Plants, Lucknow	India
	Dr. Soetikno Wirjoatmodjo	Bogor Herbarium	Indonesia
	Dr. Rogasian Mahunnah	U. Dar Es Salaam	Tanzania
	Dr. Jiang Quan-Gan	U. Beijing	China
1991	Dr. Blandine Akendengue	CENAREST	Gabon
	Dr. Johnson Jato	U. Yaounde 1	Cameroon
	Dr. Ana Sittenfeld	Inst. Nacional de Bioversidad	Costa Rica
	Dr. Jose Bonilla	U. Costa Rica	Costa Rica
	Dr. Giselle Tamayo	Inst. Nacional de Biodiversidad	Costs Rica
	Dr. Rama Rao	Univ. Hyderabad	India
	Dr. Raul Walder	Instituto Venezolano de Investigaciones Cientificas (IVIC)	Venezuela
	Dr. Virinder Parma	U. Delhi	India
	Dr. Topul Rali	U. Papua New Guinea	PNG
1992	Dr. Elizabeth Widjaja	Bogor Herbarium	Indonesia
	Dr. Bola Dhawan	Central Drug Res. Inst.	India
	Dr. Xavier Lozoya	Inst. Mexicano del Segura Social	Mexico
	Dr. Johnson Jato	U. Yaounde 1	Cameroon
	Dr. Maria LuisaVillareal	Inst. Mexicano del Seguro Social	Mexico
	Dr. Ivan Addae-Mensah	U. Ghana, Legon	Ghana
	Dr. Sonia Lagos-Wittes	Ministry of Population and Environment	Indonesia
1993	Dr. Mahmoud Mahfouz	Ministry of Health	Egypt
	Datuk J. C. Fong	Sarawak State govt.	Malaysia
	Dr. Lee Hua Seng	Sarawak State Dept. Forests	Malaysia
	Dr. Edgardo Gomez	U. Philippines, Inst. Marine Research	Philippines
	Dr. Lucien Obame	CENAREST	Gabon
	Dr. Lucienne Nze-Ekekang	CENAREST	Gabon
	Dr. Sun Handong	Kunming Inst. Botany	China
	Dr. Jose Bonilla	U. Costa Rica	Costa Rica
1994	Dr. Arie Budiman	Bureau for Information and Scientific Cooperation	Indonesia

Year	Visitor	Institution*	Country†
	Mr. Alonzo Ortiz	Ministry of External Relations	Ecuador
	Father Gabriel Casals	Philippines National Museum	Philippines
	Dr. Chairul	Indonesian Institute of Sciences	Indonesia
	Dr. S. Wirjowidagdo	Nat. Inst. Of Health Research and Development	Indonesia
	Dr. J. Rajaonarivony	CNARP	Madagascar
	Dr. Johnson Jato	U. Yaounde 1	Cameroon
	Dr. Thomas Tata	Ministry of the Environment	Cameroon
1995	Dr. J. Rajaonarivony	CNARP	Madagascar
	Mr. J. Edou	Office of the Prime Minister	Cameroon
	Dr. Johnson Jato	U. Yaounde 1	Cameroon
	Dr. T. Mbenkum	Ministry of Environment and Forests	Cameroon
	Dr. G. Chavanduka	U. Zimbabwe	Zimbabwe
	Dr. P. Mashava	U. Zimbabwe	Zimbabwe
	Mr. R. Chadwick	Legal rep., U. Zimbabwe	Zimbabwe
	Dr. W. Phillips	U. Ghana, Legon	Ghana
1997	Dr. Anatoly Syrkin	Cancer Research Center, Moscow	Russia
	Dr. Stalina Melnik	Cancer Research Center, Moscow	Russia
	Dr. P. Mashava	U. Zimbabwe	Zimbabwe
	Dr. Cao van Sung	Inst. Ecology and Biological Resources	Vietnam
1999	Dr. B.H. Southavong	Research Inst. of Medicinal Plants	Laos
	Mr. Jose Ochave	Centre for Science and Technology Law	Philippines
2000	Dr. T.Matainaho	U. Papua New Guinea	PNG
	Dr. M. Sapuri	U. Papua New Guinea	PNG
2001	Dr. M. Andriantsoa	CNARP	Madagascar
2002	Dr. T. Matainaho	U. Papua New Guinea	PNG
	Prof. L. Eastcott	U. Papua New Guinea	PNG
2003	Dr. Lic Vuthy	Department of Forestry and Wildlife	Cambodia

* CNARP: Centre National D'Appliques Recherches Pharmaceutique, Madagascar;
CENAREST: Centre National de la Recherches Scientifique et Technologique, Gabon.

Appendix D. Long-term (1 to 12 months) visiting scientists under the auspices of the NCI LOC

Year	Visitor	Home institution*	Country†	Host institution§
1990	Dr. Z. Mbwambo	U. Dar Es Salaam	Tanzania	NCI
1991	Dr. T. Rali	U. Papua New Guinea	PNG	UC Santa Cruz
1992	Mr. C. Dumancas	Siliman U.	Philippines	NCI
1993	Mr. C. Mutayabarwa	U. Dar Es Salaam	Tanzania	NCI
1994	Dr. Muney Serit	U. Malaysia Sarawak	Sarawak	NCI
	Dr. R. Andriamaharavo	U. Antananarivo	Madagascar	NIDDK, NIH
	Dr. J. Jato	U. Yaounde 1	Cameroon	NCI
1995	Dr. M. Oliveros	U. Philippines	Philippines	NCI
	Dr. Muney Serit	U. Malasia Sarawak	Sarawak	UIC
	Dr. W. Phillips	U. Ghana, Legon	Ghana	VPISU
1996	Dr. V. Rasimison	CNARP	Madagascar	Washington U.
1997	Dr. Nilufar Nahar	U. Dhaka	Bangladesh	NCI
	Dr. T. Matainaho	U. Papua New Guinea	PNG	NCI
	Dr. Sadri Said	U. Dar Es Salaam	Tanzania	U. Oklahoma
	Dr. Z. Mosihuzzaman	U. Dhaka	Bangladesh	NCI
	Ms. J. Ropivia	CENAREST	Gabon	UIC
2000	Dr. M. Lamidi	CENAREST	Gabon	U. Mississippi
2001	Dr. K. Sydara	Traditional Medicine Research Ctr	Laos	NCI, UIC
2002	Dr. R. Andriamaharavo	U. Antananarivo	Madagascar	NIDDK, NIH
2003	Dr. Ladislaus Mdee	U. Dar es Salaam	Tanzania	UIC
2004	Dr. Tran Ngoc Nunh	Inst. Ecology and Biological Resources	Vietnam	UIC
	Dr. Johnson Jato#	Bamenda U. of Science and Technology	Cameroon	NCI

* CNARP: Centre National D'Appliques Recherches Pharmaceutique, Madagascar; CENAREST: Centre National de la Recherches Scientifique et Technologique, Gabon.

† PNG: Papua New Guinea.

§ NCI: National Cancer Institute; UC: University of California; NIDDK: National Institute for Diabetes, Digestive and Kidney Diseases; NIH: National Institutes of Health; UIC: University of Illinois at Chicago; VPISU: Virginia Polytechnic Institute and State University.

\# Fulbright Scholar.

Appendix E.

MEMORANDUM OF UNDERSTANDING
between
[Source Country Organization]
and
THE DEVELOPMENTAL THERAPEUTICS PROGRAM
DIVISION OF CANCER TREATMENT AND DIAGNOSIS
NATIONAL CANCER INSTITUTE

The Developmental Therapeutics Program (DTP), Division of Cancer Treatment and Diagnosis (DCTD), National Cancer Institute (NCI) is currently screening synthetic compounds and natural product materials derived from plants, marine macro-organisms and micro-organisms as potential sources of novel anticancer drugs. The DTP is the drug discovery program of the NCI which is an Institute of the National Institutes of Health (NIH), an arm of the Department of Health and Human Services (DHHS) of the United States Government. While investigating the potential of natural products in drug discovery and development, NCI wishes to promote the conservation and sustainable utility of biological diversity, and recognizes the need to compensate source country organizations and peoples in the event of commercialization of a drug developed from an organism collected within their countries' borders.

DTP/NCI has an interest in investigating plants, terrestrial and marine micro-organisms and marine macro-organisms from [Source Country] and wishes to collaborate with the [Source Country Organization, SCO] in this investigation. DTP/NCI will make sincere efforts to transfer knowledge, expertise, and technology related to drug discovery and development to [SCO] in [Source Country, SC] (as the agent appointed by the [Source Country] Government), subject to the provision of mutually acceptable guarantees for the protection of intellectual property associated with any patented technology. [SCO], in turn, desires to collaborate closely with the DTP/NCI in pursuit of the investigation of [Source Country]'s plants, terrestrial and marine micro-organisms and marine macro-organisms and selected synthetic compounds subject to the following conditions and stipulations of this Memorandum of Understanding (MoU). [SCO] will perform the collection and processing of terrestrial plants, marine macro-organisms or micro-organisms as appropriate. It is understood that the [SCO] will be solely responsible for abiding by all source country's access policies and requirements for prior informed consent in the performance of collections. The NCI bears no responsibility for any contravention of such policies by the [SCO].

1) On the basis of in-house screening results in its anticancer screens, [SCO] may select both synthetic compounds and extracts of plants, marine macro-organisms and micro-organisms (subject to previously determined limits as to numbers per year) for anticancer testing at DTP/NCI. If suitable in-house screens are not available at [SCO], a list of available materials may be sent to DTP/NCI.

2) Prior to submission of the materials, [SCO] will send a data sheet, to be held in confidence by DTP/NCI, on each material so that DTP/NCI may check its databases for records of prior submission to DTP/NCI.

3) For pure compounds, the data sheet(s) will give pertinent available data as to chemical constitution, structure, available biological data including in-house screening results, solubility, toxicity and any precautions which need to be followed in handling, storage and shipping.

   For crude extracts, data will be provided as to the source organism taxonomy, location and date of collection, any hazards associated with the organism, available biological data and any known medicinal uses of the organism/extracts.

4) DTP will inform [SCO] which of the materials are new to the program, and such materials will be shipped to DTP for screening. DTP will provide a record of the accession number for the materials. Quantities of materials required for initial testing are 5 mg for pure compounds and 10 mg for crude extracts.

5) a) Data provided by [SCO] will be considered as confidential information of [SCO], if so labeled, and will be held confidentially by DTP/NCI, unless the data are otherwise available from public sources. No confidential information of [SCO] will be kept in files open to the public either by DTP/NCI, testing laboratories, or data processing facilities, all of which are U.S. government contractors. Only those employees directly engaged in the operation of DTP/NCI will have access to the files of information regarding the source and nature of confidential materials, unless the release of data about the materials is required under law or by court order. In the event of expiration of this agreement, the confidentiality of data provided by the [SCO] will be maintained.

b) All test results will be provided to [SCO] as soon as they are available, but not later than 270 days (nine months) from the date of receipt of the sample. If available, in vitro test results will be delivered within 90 days from receipt of the sample. [SCO] will be informed in writing of any delays beyond this period (270 days) together with an explanation of the reason(s) for delay.

c) Unless the release of test results is required under law or by court order, the parties will keep the test results and subsequently-developed data confidential until published in accordance with Article 15 or until corresponding patent applications are filed in accordance with Article 9.

6) Any extracts exhibiting significant activity will be further studied by bioassay-guided fractionation in order to isolate the pure compound(s) responsible for the observed activity. Such fractionation will be carried out in [SCO] laboratories. If [SCO] has no available bioassay, DTP/NCI may assist [SCO] to establish the necessary bioassay systems subject to the availability of the necessary resources. Alternatively, or in addition, suitably qualified designated [SCO] scientists may be sent to DTP/NCI for the isolation studies subject to the terms stated below in Article 7. In addition, DTP/NCI may assist the [SCO], thereby assisting the [Source Country], to develop the capacity to undertake drug discovery and development, including capabilities for the screening and isolation of active compounds from terrestrial and marine organisms.

7) Subject to the provision that suitable laboratory space and other necessary resources are available, DTP/NCI agrees to consider inviting senior technician(s) and/or scientist(s) designated by [SCO] to work in the laboratories of DTP/NCI or, if the parties agree, in laboratories using technology which would be useful in furthering work under this MoU. The duration of such visits would not exceed one year except by prior agreement between [SCO] and DTP/NCI. The designated visiting scientist(s) will be subject to provisions usually governing Guest Researchers at NIH. Cost-sharing and other conditions of visits will be negotiated in good faith prior to the arrival of the visiting scientist(s).

8) In the event that an agent isolated and purified from materials provided by [SCO], and/or a synthetic compound provided by [SCO] meets the criteria established by the Drug Development Group (DDG) of NCI's DCTD (DTP's parent organization), which would include, but not be limited to, in vivo activity in rodent models, further development of the agent may be undertaken by DTP/NCI in agreement with the [SCO]. Further development of the specific agent may include but not be limited to analog development through medicinal and/or combinatorial chemistry, formulation, pharmacology and/or toxicology studies. Once an active agent is approved by DTP/NCI for preclinical development (i.e., has passed the DDG at Stage IIA), DTP/NCI may collaborate with [SCO] scientists in the development of the specific agent.

9) Both [SCO] and DTP/NCI recognize that inventorship will be determined under patent law. DTP/NCI/NIH and [SCO] will, as appropriate, jointly seek patent protection on all inventions developed jointly under this

MoU by DTP/NCI and [SCO] employees, and will seek appropriate protection abroad, including in [Source Country], if appropriate. Application for patent protection on inventions made by [SCO] employees alone will be the responsibility of [SCO]. Application for patent protection on inventions made by DTP/NCI employees alone will be the responsibility of DTP/NCI.

With respect only to those compounds that have been determined to possess such significant anti-cancer potential as to be scheduled for clinical trials by DCTD, the U.S. Government shall have a royalty-free, irrevocable, nonexclusive license to manufacture and/or use by or for the U.S. Government the invention(s) claimed in any patents that [SCO] may have or may obtain on such compounds or on a process for use of such compounds. However, this license will apply only to [SCO] patents that rely upon data generated by DTP/NCI or DTP/NCI testing laboratories. This license shall be only for medical research purposes related to or connected with the therapy of cancer. The term 'medical research purposes' as used herein shall not include treatment of patients outside of clinical trials or commercial distribution of the compounds.

10) DTP/NCI will make a sincere effort to transfer any knowledge, expertise, and technology developed during such collaboration in the discovery and development process to [SCO], subject to the provision of mutually acceptable guarantees for the protection of intellectual property associated with any patented technology.

11) All licenses granted on any patents arising from the collaboration conducted under the terms of this MoU shall contain a clause referring to this MoU and shall indicate that the licensee has been apprised of this MoU.

12) Should an NCI/NIH patent on an agent discovered under this collaboration eventually be licensed to a pharmaceutical company for production and marketing, DTP/NCI will request that NIH/OTT require the licensee to negotiate and enter into agreement(s) with [SCO] and/or an appropriate [Source Country] Government agency(ies) within twelve (12) months from the execution of said license. The agreement(s) will address the concern on the part of the [Source Country] government that pertinent agencies, institutions and/or persons receive royalties and other forms of compensation, as appropriate.

Such terms will apply equally to inventions directed to a direct isolate from a natural product material, a product structurally based upon an isolate from the natural product material, a synthetic material for which the natural product material provided a key development lead, a derivative of a synthetic compound provided by [Source Country] or [SCO], or a method of synthesis or use of any aforementioned isolate, product, material or derivative; though the percentage of royalties negotiated as payment might vary depending upon the relationship of the marketed drug to the originally isolated product. It is understood that the eventual development of a drug to the stage of marketing is a long term process which may require 10-15 years.

13) In obtaining licensees, DTP/NCI/NIH will require the applicant for license to seek as its first source of supply the natural products available from [Source Country]. If no appropriate licensee is found who will use natural products available from [Source Country], or if [SCO] or their suppliers cannot provide adequate quantities of raw materials at a mutually agreeable fair price, the licensee will be required to pay to the [Source Country] Government or [SCO] as appropriate, compensation (to be negotiated) to be used for expenses associated with cultivation of medicinal organisms that are endangered or for other appropriate conservation measures. These terms will also apply in the event that the licensee begins to market a synthetic material for which a material from [Source Country] provided a key development lead.

14) Article 13 shall not apply to organisms which are freely available from different countries (i.e., common weeds, agricultural crops, ornamental plants, fouling organisms) unless information indicating a particular use of the organism (e.g., medicinal, pesticidal) was provided by local residents to guide the collection of such an organism from [Source Country], or unless other justification acceptable to both [SCO] and DTP/NCI is provided.

In the case where an organism is freely available from different countries, but a phenotype producing an active agent is found only in [Source Country], Article 13 shall apply.

15) Publication of data resulting from the collaboration under this MoU will be undertaken at times determined by agreement between [SCO] and DTP/NCI. Before either party submits a paper or abstract for publication, the other party shall have sixty (60) days to review and as necessary, file a patent application in accordance with Article 9.

16) It is the intention of NCI that [SCO] not be liable to DTP/NCI for any claims or damages arising from NCI's use of the material provided by [SCO]; however, no indemnification for any loss, damage, or liability is intended or provided by any party under this MoU. Each party shall be liable for any loss, claim, damage or liability, that said party incurs, as a result of said party's activities under this MoU, except that the NCI, as an agency of the United States, assumes liability only to the extent as provided under the Federal Tort Claim Act (28 U.S.C. § 171).

    DTP/NCI and its relevant contractors will not distribute materials provided by [SCO] to other organizations without written authorization from [SCO]. However, should [SCO] wish to consider collaboration with organizations selected by NCI for distribution of materials acquired through NCI collection contracts, DTP/NCI will establish contact between such organizations and [SCO].

18) [SCO] scientists and their collaborators may screen additional samples of the same materials for other biological activities and develop them for such purposes independently of this MoU.

19) With the exception of Articles 1-4 and 6, all other Articles shall survive the expiration of this Agreement or its termination by the [Source Country] or [SCO]. Subsequent compounds and/or extracts may be submitted under the appropriate DTP/NCI mechanism and agreement.

This MoU shall be valid as of the date of the final authorized signature below for an initial period of five (5) years, after which, it can be renewed by mutual agreement. It may be amended at any time subject to the written agreement of both parties. Copies of such amendments will be kept on file at both of the addresses indicated below. [SCO] and DTP/NCI are confident that this MoU will lay the basis for a mutually successful cooperation in discovering and developing new therapies in the treatment of cancer.

For the [SCO]: For the National Cancer Institute:

_____ _____

Director, National Cancer Institute

_____ _____

Date Date

mailing and contact address: mailing and contact address:

Technology Transfer Branch
National Cancer Institute at Frederick
NCI-Frederick
Fairview Center, Suite 500
1003 - W. 7th Street
Frederick, MD 21701-8512
Telephone: 301-846-5465
Facsimile: 301-846-6820

Appendix F. MoUs between NCI and source-country organizations: Direct collaborations

Country	Organization and date of MoU
Australia	Australian Institute of Marine Sciences, Townsville, Queensland, 1999
Bangladesh	The University of Dhaka, 1998
Brazil	Fundacao Oswaldo Cruz – FIOCRUZ, Rio de Janeiro, 1999 South American Organization for Anticancer Drug Development, Canoas, 1995 Universidade do Paulista, Sao Paulo, 1997 Universidade Federal do Parana, 1998 Universdade Federal do Ceara, Forteleza, 2001
China	Hong Kong University of Science and Technology, 1998 Kunming Institute of Botany, Yunnan, 1995 Peking University and State Key Laboratory, Beijing, 2001
Costa Rica	Instituto Nacional de Biodiversidad (INBio), 1994
Fiji	University of the South Pacific, Suva, 1999
Iceland	The University of Iceland, Reykjavik, 1998
Republic of Korea	Korean Research Institute of Chemical Technology (KRICT), 1995
Mexico	Instituto de Quimica, Universidad Nacional Autonoma de Mexico, Mexico City, 1995
New Zealand	National Institute of Water and Atmospheric Research (NIWA), Wellington, 1996
Nicaragua	Universidad Nacional Autonoma de Nicaragua, Leon, 1999
Pakistan	HEJ Research Institute of Chemistry, University of Karachi, 1994
Papua New Guinea	University of Papua New Guinea, Port Moresby, 2001
Panama	University of Panama, 1996
South Africa	Council for Scientific and Industrial Research (CSIR), Division of Food , Biological and Chemical Technologies (BIO/CHEMTEK), Pretoria, 1996 Rhodes University, Grahamstown, 1998
Zimbabwe	Zimbabwe National Traditional Healers Association (ZINATHA), 1994

Appendix G. Long-term (1 to 12 months) visiting scientists under the auspices of the NCI MoU*

Year	Visitor	Home institution	Country	Host institution†
1988	Dr. Luo Shide	Kunming Inst. Botany	China	NCI
1989	Dr. Mu Quanzhang	Kunming Inst. Botany	China	NCI
	Dr. M. Munro*	U. Canterbury	New Zealand	NCI
1990	Dr. Eunhee Woo	Seoul National Univ.	Korea	NCI
	Dr. J. Blunt*	U. Canterbury	New Zealand	NCI
1991	Dr. Jose Bonilla	U. Costa Rica	Costa Rica	NCI
1992	Dr. F. Blanco	Cancer Research Center,	Russia	NCI
	Dr. P. Mashava	U. Zimbabwe	Zimbabwe	NCI
1993	Mr. Sungwoo Lee	Genetic Engineering Inst.	Korea	NCI
	Dr. Yunlong Xu	Kunming Inst. Botany	China	NCI
1994	Dr. J. Blunt*	U. Canterbury	New Zealand	NCI
	Dr. P. Mashava	U. Zimbabwe	Zimbabwe	NCI
	Dr. Ahsana Dar	HEJ Research Inst. Of Chemistry	Pakistan	NCI
	Dr. M. Rashid*	U. Dhaka	Bangladesh	NCI
1995	Dr. P. Mashava	U. Zimbabwe	Zimbabwe	NCI
	Dr. M. Rashid*	U. Dhaka	Bangladesh	NCI
	Ms. Maria Ramirez	U. Nat. Autonoma Mexico	Mexico	NCI
	Dr. Manaf Ali	U. Pertanian	Malaysia	NCI
1996	Dr. C. Yoosook	Mahidol Univ.	Thailand	NCI
	Dr. M. Munro*	U. Canterbury	New Zealand	NCI
	Dr. Ivana Suffredini	U. Paulista, Sao Paulo	Brazil	NCI
1997	Dr. J. Blunt*	U. Canterbury	New Zealand	NCI
	Ms. H. Van Vuuren	Council for Scientific and Industrial Research	S. Africa	NCI
	Dr. P. Mukherjee	Chittaranjan Cancer Inst.	India	NCI
1998	Dr. Tan Ninghua	Kunming Inst. Botany	China	NCI
	Dr. A. M. Osman	Nat. Cancer Inst., Cairo	Egypt	NCI
	Dr. Ivana Suffredini	U. Paulista, Sao Paulo	Brazil	NCI
1999	Dr. P. Mashava	U. Zimbabwe	Zimbabwe	NCI
	Dr. M. Davies-Coleman*	Rhodes U.	South Africa	NCI
	Dr. G. Ramirez	Inst. De Investigacion Biomed.	Mexico	NCI
	Dr. S. Sperry	U. South Pacific	Fiji	UC Santa Cruz
	Dr. Joao de Carvalho	U. Campinas, Sao Paulo	Brazil	NCI
	Mr. A. Jiminez	Inst. Nacional de Biodiversidad	Costa Rica	Cornell U.
	Ms. Maria Garcia	U. Nacional Autonoma de Nicaragua	Nicaragua	UIC
2000	Dr. M. Rashid*	U. Dhaka	Bangladesh	NCI
	Ms. I. De Zuniga	U. Panama	Panama	NCI
2001	Dr. M. Rashid*	U. Dhaka	Bangladesh	NCI
	Dr. Claudia Pessoa	U. Federal do Ceara	Brazil	NCI
2004	Mr. Victor Vasquez	Inst. Nacional de Biodiversidad	Costa Rica	NCI
	Dr. Claudia Pessoa	U. Federal do Ceara	Brazil	NCI
	Dr. Leticia Costa-Lotufo	U. Federal do Ceara	Brazil	NCI

* Visiting Scientists supported through NIH Research Fellowships to NCI Laboratory of Drug Discovery, Research and Development.

† NCI: National Cancer Institute; UC: University of California; UIC: University of Illinois at Chicago.

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7 Biodiscovery Research in Panama: Linking Science, Technology, Human Health, and Conservation in the Host-Country Context

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In the context of searching for treatments for human disease from biological sources, 'bioprospecting' is generally associated with the process of exporting raw materials from a host country to an industrialized country where the subsequent steps of the drug-discovery process are carried out (Reid *et al.* 1993). Most of the literature on the subject, whether from a legal (Cabrera-Medaglia 2004a, 2004b), economic (Simpson *et al.* 1996, Vogel 1997), or general perspective (Reid *et al.* 1993, ten Kate and Laird 1999) envisions that the primary role of the host country is to provide to their partners from industrialized countries the necessary raw materials for drug-discovery research. In this model, biodiversity is essentially regarded as a commodity and the literature is dominated by the themes of access and benefit sharing (ABS).

In reality, contemporary natural products-based drug discovery is a research-driven process that is better described by the term 'biodiscovery'. There is a significant gap between a commodity such as an uncharacterized crude plant extract, usually with no commercial value or intellectual input, and a purified and characterized natural product with activity against an important disease, which can be universally recognized as intellectual property (IP), and in some cases, can be extremely valuable (Artuso 1997). The absence of any clear value for uncharacterized biological materials is in part responsible for the divergent views on what constitutes fair and equitable sharing of benefits, despite the fact that the Convention on Biological Diversity (CBD) was opened for signature in 1992 and the Global Environment Fund, the CBD's financial mechanism, had allocated a staggering US$3.86 billion to biodiversity in developing countries as of 2002 (ten Kate 2002). Regarding biodiversity as a commodity also overlooks or minimizes the fact that the drug-discovery process creates many opportunities for the substantial involvement of the host country and, with those opportunities, numerous benefits, as described below (Capson *et al.* 1996, Artuso 2002, Coley *et al.* 2003).

7.1 The International Cooperative Biodiversity Groups Program: A unique model for natural products-based drug discovery

The International Cooperative Biodiversity Groups (ICBG) Program is a unique effort that addresses the interdependent issues of drug discovery, biodiversity conservation, and sustainable economic growth. The ICBG represents a novel experimental program that is one of the first large-scale attempts to design and execute such a multi-disciplinary approach to drug discovery (Rosenthal 1997, Rosenthal *et al.* 1999). Funding for the program is currently provided by the USA government's National Institutes of Health (NIH), the Biological Sciences Directorate of the National Science Foundation, and the Foreign Agriculture Service of the United States Department of Agriculture. The cooperating NIH components are the Fogarty International Center (FIC), the National Cancer Institute (NCI), the National Institute of Allergy and Infectious Diseases, the National Institute of Mental Health, the National Institute on Drug Abuse, and the National Heart, Lung, and Blood Institute (Fogarty International Center 2006). The first awards were made in 1993, with new competitions in 1998, 2003, and 2005. There are currently seven active awards, including the Panama ICBG, which is described in this chapter.

7.2 Biodiscovery Research in a Post-CBD World: Circumstances that influenced the design of the Panama ICBG and its contractual arrangements

7.2.1 An overview of the drug-discovery and development process

The stages in the use of natural products in the drug-discovery process have been explained in detail elsewhere (ten Kate and Laird 1999). For the purposes of the current discussion I will summarize three of those stages: (i) the collection of biological materials; (ii) the purification and characterization of the chemical compounds responsible for the biological activity of interest; and (iii) the development of promising candidates for the treatment of disease.

7.2.1.1 Collecting of biological materials

A variety of strategies have been employed for the collection of biological materials for drug discovery (ten Kate and Laird 1999). The random screening of plants, microorganisms, and marine biota sponsored by the NCI has led to the discovery of important agents for treating cancer (Hallock and Cragg 2003, Simmons *et al.* 2005). The use of traditional knowledge to guide collections for drug discovery has been the subject of a vast quantity of literature (see, for example, Laird 2002, Ruiz *et al.* 2004). While successful in some cases (Cox 2001), it has generated enormous controversy in others (Dalton 2001, Larson-Guerra *et al.* 2004). Another collecting strategy relies on the use of ecological criteria for both marine (Paul and Puglisi 2004) and terrestrial collections (Coley *et al.* 2003) as described below for the Panama ICBG.

7.2.1.2 Bioassay-guided fractionation and the isolation and characterization of compounds

Crude extracts, from both marine and terrestrial sources, are often subjected to a technique known as pre-fractionation, a preliminary purification procedure that increases the concentrations of active compounds and which removes the 'nuisance' compounds that sometimes provide false positives in biological assays (Abel *et al.* 2002). The partially purified fractions are then tested in biological assays in order to detect activity against the disease or pathogen of interest in an iterative process between the chemists carrying out the purification and the scientists that carry out the biological assays. The discrete chemical compounds derived from biological sources, referred to by chemists as 'natural products', are usually isolated and characterized in the laboratories of academic or pharmaceutical collaborators in industrialized countries. Ideally, the compounds isolated are novel chemical structures, not previously reported in the scientific literature. Academic biodiscovery programs in industrialized countries routinely reach this stage and receive government funding to support their research.[1]

This is a crucial step in the drug-discovery process because it results in the production of an entity that can be recognized as IP (Gollin 1994). While not inexpensive, the procedures for obtaining patent protection under these circumstances are well established (Gollin 2005).[2] If the chemical substance is patented, academic researchers are typically listed as inventors. The institution that owns the IP, for example, the inventor's employer, may choose to negotiate a licensing arrangement with a pharmaceutical partner. In some cases, when a compound of interest is isolated in collaboration between a pharmaceutical company and an academic partner, the share of the financial payments that the academic partner receives will depend upon their degree of involvement in the de-

1 The process of isolating and characterizing natural products is expensive, time consuming, and labor intensive and may take years for a single complex and novel natural product. The economist Joseph Vogel has proposed that countries that are suppliers of the biological and chemical materials for biodiscovery research should form international cartels and that 'revenues (from drug discovery) should be distributed among countries that could have provided the same chemical' (Vogel 1997). Such a model would require an accurate (or at least an estimate) of the host country's chemical diversity. Given that the estimates of the number of species on the planet vary by orders of magnitude (Wilson 1992), that a small fraction of those species been given scientific names, and that a far smaller fraction have been characterized for their chemical content, even a rough estimate of a host country's chemical diversity is logistically impossible. The 'biological diversity cartels' discussed above would presumably use their strengthened bargaining position to demand royalties on the order of 15% from pharmaceutical companies (Vogel 1997). Suggesting royalties of this size is inconsistent with the economic realities of the drug-discovery industry and would serve only to render natural products at a distinct disadvantage to compounds developed from other sources.

2 Assistance with IP management is available from the Public Interest Intellectual Property Advisors (PIIPA). PIIPA was established as 'an independent international service and referral organization that can help fill the need for assistance by making the know-how of intellectual property professionals available to developing countries' (Gollin 2005, Public Interest Intellectual Property Advisors 2006).

velopment of the invention. In any case, the academic partner, whether based in an industrialized or a developing country, benefits by playing a more significant role in the drug-discovery process. The pharmaceutical partner benefits by receiving a compound that is characterized chemically and with known biological properties.

7.2.1.3 Development of promising candidates for the treatment of disease

The preceding discussion focused on the discovery of candidates for the treatment of human disease. If a suitable candidate is discovered that meets the appropriate criteria for potency and selectivity, the purification is usually scaled up to afford larger quantities of the natural product and studies are often carried out in order to determine the relationship between structural elements of the compound and its biological activity (Koehn and Carter 2005). In some cases, a natural product may not require additional modification in order to be a clinically useful drug, as in the case of artemisinin, which is discussed below. In most cases, however, natural products are subjected to structural modification in order to increase potency and specificity or to develop analogs that are structurally less complex and more easily synthesized in the laboratory. The subsequent steps of preclinical and clinical evaluation are lengthy and expensive (The Economist 2005). The development of promising lead compounds is beyond the scope of traditional ICBG-supported research, but is nonetheless a highly desirable outcome for promising candidates that are discovered through the program.

7.2.1.4 Tracking of samples made available for biodiscovery research

Arguments are occasionally made for the greater application of techniques such as chemotaxonomy or DNA fingerprinting in order to facilitate the tracking of samples that are made available for biodiscovery research and to ensure compliance by the users of those biological materials. These molecular and chemical techniques are routinely employed to establish taxonomic relationships between organisms (Thacker and Paul 2004). However, such techniques would add significantly to the costs of biodiscovery research in terms of labor, time, and money. Any successful drug-discovery initiative, whether commercial or nonprofit in nature, must screen significant numbers of extracts, fractions, and compounds in order to find a promising lead. It is essential to minimize time, costs, and labor invested in unsuccessful candidates in order to focus those resources on successful candidates. The application of techniques such as chemotaxonomy or DNA fingerprinting on samples entering into the drug-discovery process would have the effect of increasing the effort and expense invested in all extracts and compounds, the vast majority of which will not have useful properties for drug discovery. These issues are particularly important for nonprofit drug-discovery research for neglected diseases, where the absence of profit-generating medicines requires that the costs of research be minimized. The overall effect would be to make natural products-based drug discovery less attractive than other techniques for treating disease.

7.2.1.5 The benefits to the host country from actively participating in the drug-discovery process

The importance of natural products for the treatment of diseases of both developing and industrialized countries, combined with the labor- and research-intensive nature of the drug-discovery process, creates opportunities for a more substantive involvement of the host-country partners in biodiscovery research. Instead of focusing primarily on the economic issues associated with drug discovery, such as milestone payments and royalties, all of which are highly uncertain (ten Kate and Laird 1999), more likely benefits include the strengthening of research programs for biodiscovery research in the host country. Economic models have been published that suggest that the value of biodiversity as a potential resource for 'biodiversity prospecting' is vanishingly small (Simpson *et al.* 1996, Craft and Simpson 2001). The underlying assumption in these models is that the value of a 'marginal' species is based upon its worth to pharmaceutical researchers. Their models assume that the role of the host country is limited to exporting unprocessed materials to industrialized partners. In reality, multinational pharmaceutical companies are generally not interested in paying for crude biological samples and are far more likely look to external sources for promising, well-characterized lead compounds. Therefore, unprocessed biological samples have no 'economic' value, marginal or otherwise, since there is no significant market.[3]

3 Other assumptions made by Simpson *et al.*(1996) are also inconsistent with contemporary biodiscovery research and undervalue the biological resources in biodiverse countries: (i) Their model considers extremely large numbers of samples for screening (e.g., up to 10 million). In reality, natural products chemistry is a time consuming and expensive task and chemists tend to focus on certain taxa that are known to be rich in biologically

As discussed in detail below, the Panama ICBG provides an example in which the host country has benefited from investments in scientific infrastructure, the creation of research programs, the training of scientists, and the development of drug-discovery programs for diseases of importance to the host country. The combined investments of the Panama ICBG and the host-country government have resulted in high-quality scientific publications and IP whose authors are primarily Panamanian. While not all developing countries that wish to participate in international biodiscovery programs have circumstances that permit them to contribute to the drug-discovery process to the same degree as the host-country researchers in Panama, they can still benefit by participating in biodiscovery research. The following Papua New Guinea case study provides an informative contrast.

7.2.1.6 Case study: The University of British Columbia and Papua New Guinea and the development of the hemiasterlins

The NCI's National Cooperative Drug Discovery Group (NCDDG) program, established in 1983, supports broad, multi-disciplinary approaches to the discovery of new, synthetic, or natural product-based anticancer drugs (*see* the chapter by Newman *et al.* in this volume, Hallock and Cragg 2003, Simmons *et al.* 2005). The hemiasterlins (sponge-derived tripeptides that inhibit cell growth by destabilizing microtubules (Andersen *et al.* 1997, Mitra and Sept 2004)) were isolated as part of an NCDDG collaboration in Papua New Guinea by Raymond Andersen of the University of British Columbia (UBC), the project leader, working in a program led by Chris Ireland of the University of Utah. The entry of the hemiasterlins into clinical trials (Hallock and Cragg 2003) has resulted in milestone payments and a flow of revenues to Papua New Guinea that have been utilized to train students and enhance scientific infrastructure for biological research in the country. Ten laboratories have been built and renovated and stocked with equipment such as grinders, pH meters, balances, cabinets, and incubators. A fraction of the revenue is used to support graduate programs while another fraction supports a trust fund. One student is currently pursuing Ph.D. studies in Raymond Andersen's laboratory at UBC (T. Matainaho, pers. comm., 5 August 2005). The agreement negotiated between UBC and the government of Papua New Guinea called for the following division of revenues: one-third to the country of origin, one-third to the academic institutions involved, and one-third to the inventors. The one-third share to the institutions is further allocated according to the location of the inventors. Under such a scenario of equal numbers of inventors at UBC and the host-country institution, the host country would get one-third (33.3%) of the total automatically (the country-of-origin share), the host-country institution would get one-sixth (16.7%) of the total (half of the institutional share), and the host-country inventors would get one-sixth of the total (half of the inventor's share). The total transfer to the host country would be 66% of the total. Importantly, the agreements cover not just the original natural product lead compounds but also any synthetic analog improvements that are made on the natural product lead structure.

Despite the pioneering nature of this contractual arrangement and the benefits it has provided for the host country, it is largely unknown and has received little attention by policy experts. This example demonstrates that even when the host country does not have the capacity to perform biological assays and isolate the biologically active compounds, they can benefit by participating in a collaborative effort that results in the production of discrete chemical compounds that constitute IP. The example above also illustrates the point that ownership of IP is not a necessary condition for receiving financial benefits from an invention. While the host country derives one-third of any revenues even if their role is only supplying the materials, if host-country participants are involved in the work that results in the generation of an invention, then that share increases, consistent with the notion of 'adding value', a concept that is highly relevant to the enterprise of drug discovery (Artuso 1997).

active natural products (e.g., plants, sponges, and cyanobacteria) and may manage to study only on the order of dozens of species in the context of an entire academic career. (ii) Their assumption that ,all species within a particular taxon are 'equally different' is inaccurate. It is well known that certain species produce extraordinary numbers of natural products. For example, the cyanobacterium, *Lyngbya majuscula,* has yielded no fewer than 150 secondary metabolites (Tan *et al.*2003), an extraordinary diversity even among the cyanobacteria, a well-known source of biologically active natural products. They are correct in their conclusion that their 'simple model does not begin to do justice to the real-world complexities involved'. Refinements of the model presented by Simpson *et al.*(1996) and published by Craft and Simpson (2001) suffer from the same assumption that there exists a market for unprocessed biological materials by the pharmaceutical industry.

7.2.2 Commercial versus nonprofit: Two paradigms for developing new medicines

The following discussion will consider two different paradigms for the development of candidates with the potential to treat disease. The first paradigm is the 'commercial' model for drug discovery and which assumes that any medicine that is developed will be directed towards the diseases of wealthy countries and that the product will generate profits. This model dominates the discussions of ABS issues and biodiscovery research in general (see, for example, Simpson *et al.* 1996, Vogel 1997, ten Kate and Laird 1999, Cabrera-Medaglia 2004a, 2004b). The second paradigm is a 'nonprofit' model for drug discovery for neglected diseases, i.e., diseases affecting poor populations in developing countries. In this model, the research is directed towards the needs of patients with minimal financial resources with the goal of making effective medicines available at the lowest possible price.

In the commercial model for biodiscovery research, the pharmaceutical industry plays the leading role in the development of promising lead compounds and the high rate of compound attrition in the discovery and development process is compensated by a commercial return for those products that do reach clinical use. Although research is often conducted in-house, the pharmaceutical industry frequently looks to external sources for innovation and promising leads, such as the characterized natural products described in the preceding section (The Economist 2005). A recent analysis reported that it requires an average of 12 years to develop a drug from start to finish and at an average cost of somewhere between US$802 million and perhaps as high as $1.5 billion. For every 10,000 molecules screened, an average of 250 enter preclinical testing, 10 make it to clinical trials, and only one is approved (The Economist 2005). Accordingly, it is in the best interest of the pharmaceutical industry to minimize risk and work with materials, including natural products, that have been characterized biologically and chemically and that have a greater chance of becoming pharmaceutical agents. There are a number of natural products that have entered clinical trials that were discovered through collaborations between academic researchers and pharmaceutical companies. Examples include discodermolide, isolated from the sponge *Discodermia dissoluta* by the Harbor Branch Oceanographic Institution (Sennet *et al.* 2002), the hemiasterlins, isolated from the sponges *Auletta* sp. and *Siphonochalina* spp. (Andersen *et al.* 1997), dolastatin 10, isolated most recently from a *Symploca* sp. cyanobacterium, and a host of other compounds (Hallock and Cragg 2003, Newman and Cragg 2004, Simmons *et al.* 2005).

The nonprofit model for drug discovery is applicable to the development of drugs to treat neglected diseases. Earlier perceptions were based on the assumption that these diseases were unprofitable and therefore unattractive to pharmaceutical companies. The landscape for neglected-disease drug-development has changed markedly since 2000 however, reflecting significant and fundamental structural changes (Moran 2005). There were 63 neglected-disease drug projects underway at the end of 2004, including two new drugs in the registration stage and 18 in clinical trials, half of which were in Phase III. The increase in activity is due in large part to 'public-private partnerships' (PPPs), which are defined as public-health-driven not-for-profit organizations that drive neglected-disease drug development in collaboration with industry groups. As the PPPs conduct three-quarters of the known neglected-disease drug-discovery programs they have become the primary driving force behind the nonprofit model of drug discovery. Eighty percent of the PPP drug development activity is funded through private philanthropy (Moran 2005, Nature 2005b, Cohen 2006).

Multinational drug companies conduct half of the neglected-disease projects, either working through PPPs or working alone, but with the view of partnering at a subsequent stage (Moran 2005). The bulk of the research is conducted by four companies that have formally established neglected-disease divisions: GlaxoSmithKline, Novartis, AstraZeneca, and Sanofi-Aventis. In all cases, the companies are working on a noncommercial basis, meaning they are not motivated by commercial returns in neglected-disease markets, and they have agreed to provide products to patients in developing countries at nonprofit prices. The incentives for the multinational drug companies to participate in the neglected-disease market have been cited as: (i) enhancing their reputation due to their failure to address neglected diseases; (ii) corporate social responsibility and ethical concerns; and (iii) strategic concerns, such as positioning themselves in developing countries or having access to low-cost but highly skilled researchers. The PPPs play a crucial role in facilitating the participation of multinational companies,

which provide the technology in which they have invested for decades and their expertise in discovery, development, and distribution. Other important roles of the PPPs include: (i) integrating and coordinating the multiple industry, academic, and other partners in the drug-development pipeline; (ii) allocating public and philanthropic funds to the appropriate projects; (iii) managing neglected-disease drug portfolios; and (iv) their ability to lower costs by leveraging substantial in-kind resources and by excluding the costs of capital (Moran 2005).

Among the better known PPPs are the Medicines for Malaria Venture (MMV), a nonprofit organization created to discover, develop, and deliver new antimalarial drugs (Medicines for Malaria Venture 2006) and the Drugs for Neglected Diseases initiative, an independent, nonprofit drug development initiative that aims to develop new, improved, and field-relevant drugs for neglected diseases such as leishmaniasis, human African trypanosomiasis, Chagas' disease, and malaria (Drugs for Neglected Diseases Initiative 2006). The Institute for OneWorld Health is a nonprofit pharmaceutical company that directs a worldwide effort to uncover, research, and develop new medicines for neglected infectious diseases (Institute for OneWorld Health 2006). Academic consortia have also developed programs that have developed promising candidates for the treatment of the diseases of the developing world. For example, a consortium based at the University of North Carolina at Chapel Hill has developed a compound that is undergoing clinical trials against early stage sleeping sickness, uncomplicated malaria, and *Plasmodium jiroveci*-pneumonia (Werbovetz 2006).

7.2.3 Natural products and contemporary drug discovery

Natural products are unsurpassed for the variety and complexity of their chemical structures. Their chemical complexity is not the result of a random process but instead is the result of millions of years of selective pressure to develop molecular structures in response to intense interactions between species (Harborne 1993, Firn and Jones 2003). They are ideal for maximizing the success of screening for novel structures and for identifying previously unrecognized target proteins and molecular binding sites. Natural products are well recognized sources of new 'lead' compounds, namely, chemical substances that have a different structure from existing treatments and which act by a different molecular mechanism. A well-known example is taxol, first isolated from the Pacific yew (*Taxus brevifolia*) from an NCI-sponsored collection, which presented a novel mechanism for fighting cancer cells, namely interfering with the depolymerization of microtubules (Cragg and Newman 2005). New lead compounds are of paramount importance when addressing the issue of disease-causing pathogens that have become resistant to existing treatments, particularly relevant in the case of antibiotics (Levin 2004) and the treatment of tropical parasitic disease (Klausner and Alonso 2004). Discussed in greater detail below, the antimalarial compound artemisinin, derived from the herb *Artemisia annua*, provided a new structural prototype for treating malaria (Vennerstrom *et al.* 2004).

7.2.3.1 Natural products and the pharmaceutical industry

In their concise review of the importance of natural products to modern pharmaceutical research, Koehn and Carter (2005) reported that of the 877 small-molecule new chemical entities (NCEs)[4] introduced between 1981 and 2002, roughly half (49%) were natural products, semi-synthetic natural-product analogs, or synthetic compounds based upon natural-product structures. Natural products have also been invaluable tools for basic research, helping scientists decipher complex biochemical pathways (Clardy and Walsh 2004). Nevertheless, pharmaceutical research involving natural products has experienced a decline during the past two decades. The decline was attributed to the following factors: (i) the introduction of high throughput screening (HTS) against specific biological targets, a format inconsistent with the time-consuming nature of natural-products isolation; (ii) the development of combinatorial chemistry which produces large collections of synthetic structures; (iii) advances in molecular and cellular biology and genomics which increased the number of targets and de-

4 An NCE is a medication that contains an active ingredient that has not been previously approved for marketing in any form (Koehn and Carter 2005).

creased drug discovery timelines; (iv) a declining emphasis on infectious disease therapy, a traditional area of strength for natural products; and (v) the CBD and uncertainties with respect to collections of biological materials for drug discovery (Koehn and Carter 2005).

Nevertheless, emerging trends, coupled with unrealized expectations from current research and development (R&D) strategies, including combinatorial chemistry, are prompting a renewed interest in natural products as a source of chemical diversity and generation of novel lead compounds (Rouhi 2003, Clardy and Walsh 2004, Koehn and Carter 2005). This renewed interest is consistent with the difficulties experienced in recent years by the pharmaceutical companies in getting new drugs out of the pipelines and into the market (The Economist 2005). It must be considered that the pharmaceutical industry has a broad variety of tools at its disposal for drug discovery, and will rely on natural products only to the degree that they are available on practical terms.

To better appreciate the relative importance of natural products for the pharmaceutical industry, it is constructive to consider the success of a drug that was recently developed by Novartis to treat chronic myeloid leukemia (CML). CML is associated with a unique tyrosine kinase, a class of enzymes that play key roles in diverse biological processes such as growth, differentiation, metabolism, and programmed cell death and has been the subject of decades of basic biomedical research (Paul and Mukhopadhyay 2004). Based upon the knowledge obtained from the research on tyrosine kinases and the unique properties of the of the CML-associated enzyme, Novartis developed an inhibitor, imatinib mesylate, marketed as Gleevec[5], which produces marked responses in up to 90% of patients. The lengthy and expensive effort that culminated in the development of Gleevec benefited from a well-funded collaboration involving academia, government, and the pharmaceutical industry (Cortes and Kantarjian 2005). Gleevec is one of many examples of an effective therapeutic agent that is not based upon natural products, but rather a steadily growing understanding of complex biological processes, in this case, the role of the tyrosine kinase associated with CML. These developments suggest that natural products will have to be made available on competitive terms if they are to continue playing an important role in the treatment of diseases of importance to the industrialized world.

7.2.3.2 It is in the best interest of researchers from industrialized countries to play by the rules

Gollin (1999) has described the incentives and disincentives for participants in biodiscovery research from industrialized countries to abide by international and national rules that regulate access to biological resources. The disincentives include: (i) potential patent disputes on inventions that are developed from materials that were not legally collected; (ii) the potential recovery of profits by the host country or person from inventions derived from illegally harvested materials; (iii) the reduced value of materials collected illegally; and (iv) the likelihood that the practitioner who does not collect samples legally or who fails to provide benefits will be denied access to biological samples in the future. Alternatively, the collector who plays by the rules is likely to benefit from continued access to biological materials and to benefit from the goodwill established in the process. From the perspective of the pharmaceutical company, given the extraordinary expenses associated with drug development that were described above, it simply makes no sense to begin the lengthy and costly drug-discovery process with materials of an illegal or dubious origin.

7.2.3.3 The industry standard for biodiscovery research: Long-term relationships between host-country participants and well-defined contractual agreements

As described above, the pharmaceutical industry routinely looks to external sources for innovations and compounds that can be 'in-licensed' from other sources, including natural products. There are numerous arrangements through which a pharmaceutical company can partner with commercial or academic collaborators (ten Kate and Laird 1999). In the case of contemporary USA government-sponsored biodiscovery research, a common arrangement involves a pharmaceutical company partner that works with a team of academic researchers that have a well-established relationship with a host country where

5 While Gleevec was originally thought to bind to a single target, providing support for the single-target approach to drug discovery, subsequent research has shown that it may not be as specific as originally thought. It has been shown to target a platelet-derived growth factor (PDGF) receptor, and is active against a second rare cancer known as gastrointestinal stromal tumor. Researchers now think that too much specificity can be problematic and that drugs that bind to more than one target may provide a better approach for treating complex diseases (Frantz 2005).

collections of biological materials are carried out. Funding often comes from the NIH, for example, through the NCDDG program described above. A similar arrangement, described in detail below for the program in Panama, is utilized for the ICBG Programs. In both cases, participants from academic institutions are often responsible for establishing and maintaining the relationship with the host country. Virtually all of the host countries are signatories to the CBD and academic partners often have to invest years and considerable financial resources in order to establish a long-term and productive relationship. Just as described above for the pharmaceutical industry, it is in the best interest for the academic partners to play by the rules. Funding from the NIH requires the presence of transparent, coherent, and equitable contractual agreements with host-country partners (Rosenthal 1997, Rosenthal *et al.* 1999, Hallock and Cragg 2003). This is an important consideration when considering the argument, routinely heard, that academic and pharmaceutical researchers, once they find a promising lead, will then seek to source that material from another country with less-stringent requirements for access or where it can be found more cheaply (Vogel 1997).

In general, both academic and pharmaceutical participants benefit from stable, long-term relationships with host countries and it is not in the interest of the academic partner to 'burn bridges'. In the case of USA-based pharmaceutical companies, it is largely a moot point as they seldom have direct contact with the host country for collections. To be sure, from the perspective of USA-based academic and industrial collaborators, the relationships with host countries have evolved, in particular since the CBD came into effect. Just as host countries are grappling with the issues of ABS, scientists from industrialized countries are attempting to cope with a changing set of expectations and regulations that can pose significant and sometimes insurmountable challenges. In some cases, researchers are unable to reach a satisfactory agreement and the research is either thwarted or terminated. As with any group of individuals, some researchers have higher standards than others, but the 'industry standard' has unmistakably been raised since the CBD entered into effect for all of the parties involved, including donors, academic scientists, and partners from the pharmaceutical industry, an important point for host-country participants and policy makers to take into account.

7.2.3.4 Drug discovery for diseases of importance to developing countries

Most of the discussion on the use of genetic resources from developing countries for drug discovery focuses on economic uses. In a recent description of an international regime for ABS, Young (2004) writes 'Investigations and workshops have demonstrated that most developing countries that attempt to develop ABS legislation have been preoccupied by potential profits.' The implicit assumption is that biodiscovery research is directed towards drug discovery for diseases of importance to wealthy nations in which biodiversity is regarded as a commodity (i.e., the commercial model for drug discovery discussed above). Discussions on biodiscovery research frequently overlook the potential impact of the host country's biodiversity on diseases of importance to that country.

Most of the 7,500 plus medicines currently in development by biotech and pharmaceutical companies are for chronic diseases of wealthy nations, consistent with long-term administration and significant profits. Of the approximately 1,500 medicines launched over the past 30 years, fewer than 20 deal specifically with tropical disease (The Economist 2005). While there is an increasing awareness of the devastating impact of the diseases of the developing world (Gelb and Hol 2002, Sachs 2002, Klausner and Alonso 2004, Cross 2005) those needs are frequently absent in policy discussions on biodiscovery research, an omission that may have a significant impact on health in the developing world. As described above in the discussion on the nonprofit model for drug development, the outlook has improved markedly over the past few years for drug development for neglected diseases. It is now essential to now broaden the scope of debates on ABS to take those developments into account.

7.2.3.5 The importance of natural-product research for tropical parasitic diseases

The impact of tropical protozoan diseases such as malaria, Chagas' disease, and leishmaniasis on the developing world is staggering: they collectively affect three billion people, most of whom survive on less than US$2 a day (Gelb and Hol 2002). For most diseases caused by tropical parasites, there are either no safe efficacious drugs or, as in the case of malaria, once-effective and affordable drugs are less widely used due to increased pathogen resistance to them (Klausner and Alonso 2004).

Each year 300 to 500 million new clinical cases of malaria are announced, although the actual impact of the disease may be significantly greater since many clinical events are never reported (Snow *et al.* 2005). A malaria vaccine has been a long-standing goal but there is little prospect of it becoming available within the next decade (Hemingway and Bates 2003). The cornerstone of malaria control worldwide remains effective and inexpensive drugs (Greenwood 2004) in which plant-derived natural products, or their derivatives, have played a central role. The quinoline antimalarials and related compounds such as chloroquine owe their origins to quinine, isolated from the bark of the Peruvian tree, *Cinchona ledgeriana* (Meshnick and Dobson 2001). Chloroquine has for decades been the primary chemotherapeutic means of malaria treatment and control, but resistance to the compound has developed on a global scale. Artemisinin has been used for 1,500 years in traditional Chinese herbal fever remedies and has received considerable attention in the scientific and health care communities (O'Neill 2004, Enserink 2005). Artemisinin-based combination therapies (ACTs), provide a rapid cure and are an immediate solution to the problem of drug resistance, but ACTs cost several times as much as existing drugs (Greenwood 2004). The first sign of resistance to artemisinin by *Plasmodium falciparum* was recently reported, highlighting the need to continue the search for more natural product-based breakthrough innovations (Jambou *et al.* 2005). An initiative supported by MMV has been successful in the development of synthetic compounds that are modeled after artemisinin and that may provide accessible and effective treatments (Vennerstrom *et al.* 2004).

Chagas' disease, or American trypanosomiasis, affects 16 to 18 million people, currently killing 10 to 20% of the people that it infects, and some 100 million, approximately 25% of the population of Latin America, are at risk of acquiring the disease (Gelb and Hol 2002). In the case of the leishmaniases (the collective diseases caused by the protozoan parasites of the genus *Leishmania*), an estimated 12 million people are infected worldwide, and 350 million live in endemic areas at risk of acquiring the disease. There are no effective means of prevention and the control of *Leishmania* infections relies primarily on chemotherapy (Loiseau and Bories 2006). For visceral leishmaniasis, miltefosine has been registered for use in India (Gelb and Hol 2002) and the aminoglycoside, paromomycin, derived from the bacterium *Streptomyces rimosus,* has shown promising results in phase III clinical trials (Institute for OneWorld Health 2006). Nevertheless, there will remain a pressing need for new anti-leishmanials (Gelb and Hol 2002).

The tropical parasitic diseases discussed above, malaria, Chagas' disease, and leishmaniasis, have benefited from recent advances in medicine and molecular biology which will ultimately have an impact on the treatment of these diseases. The recent sequencing of the genomes of the parasites *Plasmodium falciparum* (a malaria-causing protozoan), *Trypanosoma cruzi*, *T. brucei*, and *Leishmania major* will facilitate the search for treatments for those diseases at least in part by defining new targets for therapeutic agents (Ash and Jasny 2005, Cross 2005). Nevertheless, there will remain a pressing need for new agents to interact with those targets, a need that the pharmaceutical industry alone is not likely to fulfill (Cross 2005), meaning that natural products are likely to continue to play a leading role.

The promising development of the nonprofit programs for drug discovery, discussed above, is likely to facilitate the development of novel treatments for neglected disease. But just as in the commercial model for drug discovery, the nonprofit model is absolutely dependent upon the discovery of novel lead compounds to enter the drug-discovery pipeline. As written in a recent article on drug development for neglected diseases '… if we are to effectively manage health outcomes in the long-term then we must also overcome drug resistance, which is a growing problem for many neglected diseases, including malaria, TB, leishmaniasis and sleeping sickness. To do so, we need to focus on 'breakthrough' innovation – that is, novel compounds with a novel mechanism of action against parasites and microbes' (Moran 2005). The diversity of structures of natural products has resulted in many 'breakthrough' innovations, and there are undoubtedly many remaining to be discovered.

7.2.4 Summary: Removing access to biodiversity is a lose-lose proposition

As Cabrera-Medaglia (2004b) wrote, in describing Costa Rica's experience in developing ABS legislation, 'Without access there is no benefit sharing.' The lost benefits are not only economic but also include potential treatments for disease, especially those of importance to tropical countries and lost opportunities for strengthening host-country science programs. While there is a renewed recognition of the importance of natural products in drug discovery in the pharmaceutical industry, that recognition is tempered by the enhanced difficulties, both real and perceived, in accessing biological resources from biologically diverse foreign countries (Koehn and Carter 2005). Drugs such as Gleevec are evidence that the pharmaceutical industry can draw upon a broad range of techniques to develop novel therapies that are independent of natural products, and the relative importance of those techniques will increase if access to biological resources in developing countries is made difficult or impossible. While state-of-the-art technology for drug discovery will continue to be directed towards diseases of importance to industrialized countries, the same trend is not likely to be seen for the diseases of the developing world. By restricting the drug-discovery pipeline for neglected diseases by hindering or preventing access to biological sources, the discovery of compounds such as artemisinin becomes far more unlikely, and the patients from the developing world that suffer from diseases such as malaria will bear most of the burden.

While difficult to quantify, the increasing difficulty for academic researchers to access biodiversity in tropical countries is having a significant impact on natural products-based drug discovery. The experience of Professor William Fenical from the Scripps Institution of Oceanography at the University of California at San Diego, a leading figure in the field of marine natural products chemistry, is informative. While his earlier research involved the use of marine invertebrates, increasingly difficult access to those organisms from other countries has led his program focus on actinomycetes that are cultured from marine sediments, often collected in USA territorial waters. Referring to policies adopted by certain host countries, he writes 'In my opinion, restrictive governments have destroyed a huge amount of the opportunities for their scientists to receive education and collaboration abroad. True collaborations are, currently, almost nonexistent. The short-sighted view that someone, a foreigner, might make money has all but eliminated global, cooperative research in natural products chemistry.' (W. Fenical, pers. comm., 2 October 2005). The overall impact of this tendency is to exclude many biodiversity-rich countries from the drug-discovery process, effectively denying them the comparative advantage for biodiscovery research that their natural resources could otherwise provide.

7.2.5 Losing the forest for the trees? Tropical biodiversity is a disappearing resource

At the same time that the increasingly restricted access to biological resources in the tropics is eliminating or discouraging biodiscovery research programs (Brush and Carrisoza 2004), the same biodiversity, both marine and terrestrial, is increasingly threatened. Humanity is rapidly destroying the terrestrial habitats that are the richest in number of species. Around two-thirds of all species occur in the tropics, largely in tropical humid forests (Pimm and Raven 2000). These forests originally covered between 14 million and 18 million square kilometers and around half of that remains. Much of the clearing of rainforests is recent and clearing now eliminates about 1 million square kilometers every 5 to 10 years. Burning and selective logging severely damage several times more than the area that is cleared (Pimm and Raven 2000).

Coral reefs are the most structurally complex and taxonomically diverse marine ecosystems, providing habitat for tens of thousands of associated fishes and invertebrates, but will not survive for more than a few decades unless they are promptly and massively protected from human exploitation over large spatial scales (Pandolfi *et al.* 2003). Among coral reefs, tropical reefs are major biodiversity hotspots and represent a high conservation priority (Roberts *et al.* 2002).

Given the scale of the threats to both terrestrial and marine habitats in the tropics and the rates at which habitats are being altered and destroyed, it is ironic that the majority of books and articles on the subject of biodiscovery emphasize ABS issues while often ignoring the

fact that the very ecosystems from which the resources are derived are imperiled. In the context of drug discovery for human health, developing countries stand to lose the most as they lose the very species that contain potential treatments for disease. In the context of providing biological resources for international biodiscovery research, they are losing the very ecosystems that could provide them with a comparative advantage.

7.2.6 Biodiscovery versus conservation: A false dichotomy

It is common to encounter, in the policy-oriented literature on biodiscovery, a perceived dichotomy between 'sustainable development', which is taken to mean 'allowing access for bioprospecting' as opposed to 'conservation', which often implies 'no access' (Ferreira-Miani 2004, Carrizosa 2004c). In all but the most extreme of cases, this is a false dichotomy. A concern that is frequently voiced is that of unsustainable harvesting of natural resources once a positive lead is identified and large quantities are required for commercial development. Three recent examples of compounds of interest to the pharmaceutical industry indicate more likely scenarios. Taxol, the well-documented anti-cancer compound originally isolated from the Pacific yew, is too complex to synthesize in a cost-effective manner. Once the potential demand for the compound was clear, there was enormous incentive for the development of alternatives to isolation of the compound from the bark of the tree. As a result, a semi-synthetic route to Taxol was developed that relies upon the elaboration of a relatively abundant precursor to Taxol that is derived from the needles of the European yew, *Taxus baccata* (Cragg and Newman 2005). In the case of discodermolide, even to obtain the relatively small quantities necessary for Phase I clinical trials it was first necessary to obtain a synthetic source that did not require the isolation of the compound from the sponge (Freemantle 2004). As mentioned above, MMV-sponsored research has led to synthesis of chemical compounds that used artemisinin as a guide, but that have superior antimalarial properties (Vennerstrom *et al.* 2004). In summary, given the volumes of raw material that would be required to satisfy the market for any modern pharmaceutical agent originally found in organisms such as plants or marine invertebrates, it is exceedingly unlikely that the demand would be met by collections from its original source.[6] Accordingly, in any legitimate contemporary biodiscovery program, the concern that a commercial or academic partner could pose a threat to the resource is negligible and pales by comparison with the current destruction of tropical habitats described above.

In Costa Rica, ecotourism generates approximately US$1.5 billion per year (C.M. Rodríguez, pers. comm., 23 June 2005) and the country is considered to have a strong conservation ethic. Costa Rica is also the country that has participated in the greatest number of natural products-based drug-discovery programs: 15 approved projects since 1991 (Brush and Carrizosa 2004). That both activities should thrive in Costa Rica (at least until the passage of the Law of Biodiversity) suggests that the two are compatible and that biodiscovery research that is responsibly executed by any reasonable measure has no significant impact on biodiversity.

7.3 Contemporary biodiscovery research in Latin America

In order to put the Panama ICBG in the context of the current situation in Latin America, it is useful to compare selected approaches to ABS policies on regional and national levels. A detailed discussion of ABS policies in the Latin American countries included in the Pacific Rim can be found in Carrizosa *et al.* (2004). The Andean Community provides the only example of a regional approach to ABS regulation in Latin America (Ferreira-Miani 2004). Following the lead of the Andean Community, countries of the Central American region developed a draft protocol on 'Access to genetic and biochemical resources and their associated knowledge' (Carrizosa 2004b). The

6 There are cases in which chemical compounds used by the pharmaceutical industry are derived directly from natural sources. From plants, examples include vincristine and vinblastine, derived from the Madagascar periwinkle, *Catharanthus roseus* (Rischer *et al.*2006). In the case of marine invertebrates, the bryozoan, *Bugula nertina,* is a source of bryostatin 1, and *Lissodendoryx* sp., is a source of halichondrin B, both of which are obtained by farming (Faulkner 2000). As the case studies in this chapter involving Panama and Papua New Guinea describe, the contractual arrangements for the respective biodiscovery programs ensure that the host country will continue to receive benefits even if the commercially available product is not derived from the host country where the original collections occurred.

example set by the Andean Community is widely cited in the policy-oriented literature as a model for addressing ABS issues in the context of the CBD (for example, ten Kate and Laird 1999, Barber *et al.* 2002, Carrizosa 2004b). On a national level, Costa Rica has by far the most extensive experience in dealing with ABS issues in Latin America and probably the world, and in 1998 adopted a Law of Biodiversity to regulate those activities (Cabrera-Medaglia 2004a). As a country that initially addressed ABS issues and biodiscovery research through contractual arrangements, and that now attempts to do that through national legislation, Costa Rica provides a useful case study for Latin America and other developing countries. Other countries in Central America, such as Nicaragua, have developed proposals for similar laws (Carrizosa 2004b). Under the ICBG Program a number of biodiscovery programs have been implemented in Latin America, including Peru (Lewis *et al.* 1999), Suriname (Kingston *et al.* 1999), and a single project incorporating Mexico, Argentina, and Chile (Timmerman *et al.* 1999).

7.3.1 Regional approaches to regulating access to biological resources in Latin America: Decision 391 of the Cartagena Agreement

Decision 391 of the Cartagena Agreement of the Andean Pact Countries was adopted in 1996 by the Andean countries of Bolivia, Ecuador, Venezuela, Colombia, and Peru (Isaza Casas 1999, Ferreira-Miani 2004). The law was drafted in response to several factors: the 'the need to develop legislation to protect genetic resources in order to gain control over the inventions derived from them', the fact that Andean countries share significant biodiversity, a perceived sense of urgency to approve a decision to regulate ABS issues, and the 'green gold' perception that their biological resources were extremely valuable economically and would yield an immediate return (Ferreira-Miani 2004). The range of materials whose access is regulated by Decision 391 is broad, and includes genetic resources, derivative products, intangible components (e.g., traditional knowledge), *ex-situ* and *in-situ* collections (native and domestic) and their derivatives indigenous to each member country, and even migratory species which can be found in the countries.[7] The inclusion of *ex-situ* collections means that botanical collections, seed banks, zoos, breeding centers, botanical gardens, aquariums, tissue banks, collections in natural history museums, herbaria, and other settings are incorporated, whether located in the host country or elsewhere (Ferreira-Miani 2004). Decision 391 covers a broad range of activities including 'research, bioprospecting, conservation, industrial application, or commercial profit, among others' (Ferreira-Miani 2004). Once approved under the Cartagena Agreement of the Andean Pact Countries, Decision 391 became binding and it was automatically integrated into national legislation. In practice, however, it has been necessary for each country to adopt specific policies in order to incorporate Decision 391 into national contexts (Carrizosa 2004b).

In Colombia, Decision 391 constitutes the main legal framework for access to genetic resources. Due to the broad range of activities that fall under the scope of the agreement and the ambiguity of certain definitions, even routine transactions such as transferring botanical vouchers may fall under the agreement. Commenting on the Colombian experience in dealing with the agreement, Ferreira-Miani (2004) wrote 'Decision 391 presents ambiguities that have prevented not only its implementation at a national and regional level, but has also prevented the advancement of science and the involvement of traditional communities in access and benefit-sharing projects.' Independent cases in Venezuela and Ecuador resulted in one-year moratoriums on the transfer of botanical vouchers, both of which were attributed to Decision 391 (Grajal 1999).

Overall there has been little implementation of Decision 391. Between July 1996 and July 2001, Venezuela, Ecuador, Bolivia, and Peru received 26 applications, only one of which was approved, but not a single access contract had been signed as of January 2004. One exception has been Venezuela, which has invoked Decision 391 to facilitate access to 12 noncommercial projects requiring access to biological resources (Carrizosa 2004b). In Colombia, potential applicants either do not understand the decision or they ignore it, perceiving it as an obstacle

7 As described by Carrizosa (2004b), procedures for the access and use of *ex-situ* collections for biodiscovery research, whether established before or after the adoption of the CBD, are generally not clearly defined and the ownership of those *ex-situ* collections is often controversial.

to research. The absence of a more participatory consultation during the drafting and the lack of adequate technical, scientific, and economic experience were cited as some of the factors influencing the outcome of Decision 391 (Carrizosa 2004c, Ferreira-Miani 2004). This has resulted in 'a net loss of opportunities for the sustainable use of biological resources' (Ferreira-Miani 2004).

7.3.2 National approaches to regulating access to biological resources in Latin America: Costa Rica

A total of 15 international agreements have been negotiated by Costa Rica's National Biodiversity Institute (INBio), the best known of which is the contractual agreement between Merck Pharmaceutical and Costa Rica. Signed in 1991, this was the country's first agreement under which biological samples were provided to a company for pharmaceutical and veterinary purposes (Reid *et al.* 1993, Cabrera-Medaglia 2004a). Adopted before the CBD was opened for signature, the first contract resulted in a two-year research and sampling payment of US$1.135 million to Costa Rica. It was cited as 'a watershed in the history of biodiversity prospecting' and received worldwide attention (Reid *et al.* 1993). It was renewed three times before expiring in 1999.

The policy-oriented literature on biodiscovery is replete with references to the Merck-INBio agreement (see, for example, Reid *et al.* 1993, ten Kate and Laird 1999, Laird and Lisinge 2002). Combined with the perception of the enormous wealth generated by pharmaceutical companies (ten Kate and Laird 1999), the Merck-INBio agreement fueled expectations, in Latin America and elsewhere, that biodiversity is a commodity for which industrialized countries should pay, and are willing to do so. While the details of the working arrangements between INBio and its pharmaceutical partners have not been made public (confidentiality is a standard practice), the literature suggests that INBio's business model has relied primarily on the collection of biological samples and preparation of extracts which were then made available for industrial partners (Artuso 2002). As reported in 2003, none of the agreements entered into by INBio had generated royalty payments, but the benefits that Costa Rica has derived through this experience are evident and include monetary payment for samples, technology transfer, equipment, training for scientists, experience in negotiations, and a better understanding for the potential commercial uses of biodiversity (Artuso 2002, Cabrera-Medaglia 2004a). Sixteen years later it is now more clear than ever that the Merck-INBio situation was the exception to the rule and, in part, a product of Costa Rica's biological, political, and social environment (Reid *et al.* 1993).

Costa Rica is the only country in the region that has a national law (Law of Biodiversity, adopted in 1998) that seeks to regulate 'access to genetic material, biochemical resources and traditional knowledge' (Cabrera-Medaglia 2004a). The legislation was designed to implement the CBD in Costa Rica and its goals are to promote the conservation and sustainable use of biodiversity and to ensure the equitable sharing of benefits. The details of the law as well as the process and context of its development have been described in detail by Cabrera-Medaglia (2004b). The Law of Biodiversity is designed to regulate 'specifically the use, management, associated knowledge and distribution of benefits and costs derived from the utilization of the elements of biodiversity'. Despite the fact that the Law of Biodiversity was adopted in 1998, its application and implementation in key areas still remains to be determined. An act to declare the law unconstitutional was brought by the Attorney General's Office at the request of Costa Rica's own Ministry of Environment and Energy. The challenge is based upon the duties of an office created by the Law of Biodiversity, the Commission of the Management of Biodiversity (CONAGEBIO), which include the formulation of biodiversity and ABS policies and the management of public funds (Cabrera-Medaglia 2004a, Carrizosa 2004c).

The law has several significant difficulties including the lack of clarity and the presence of provisions that may actually prevent access. As of 2004, because of the act on unconstitutionality filed against the law, it has not been implemented (Cabrera-Medaglia 2004a). The outcome was reflected by a 'legislative process [which] revealed a lack of technical expertise from certain sectors such as academic, rural, political and entrepreneurial groups, some of which used the opportunity to make political rather than technical statements' (Carrizosa 2004c). The time

constraints imposed by the Parliamentary procedures for the approval of legislation prevented a full discussion of some of the most controversial and relevant aspects of the law, begging the question as to whether the legislative process is the appropriate venue for host countries to develop regulations for biodiscovery research. Overall, if the Law of Biodiversity is ever implemented, there are elements of the law that 'suggest a difficult future for bioprospectors' (Cabrera-Medaglia 2004b). Scientists attempting to work under the Law of Biodiversity should be concerned since the 'regulatory authorities tend to be suspicious and try to impose strong control mechanisms in order to avoid past injustices. Suspicion and mistrust appear to be the main motivators behind this tendency.' (Cabrera-Medaglia 2004b).

As the country that some consider to have the most successful ABS system, and the greatest experience with international biodiscovery programs, Costa Rica is perhaps the best available test case for comparing the benefits of a contract-based approach to developing ABS procedures versus national legislation. As Brush and Carrizosa (2004) conclude 'the case of Costa Rica suggests that success in the implementation of ABS policy is best achieved in a decentralized system with flexible norms of negotiating benefits, a simple system whereby the entity empowered to grant access negotiates directly with the organization seeking access and where the number of parties involved in the negotiation and permitting process is minimized'.

7.3.3 Putting the cart before the horse: Regulations to implement the CBD are hindering all access to biodiversity, stifling opportunities from which host countries could gain experience

Article 15 of the CBD stipulates 'Each Contracting Party shall endeavor to create conditions to facilitate access to genetic resources for environmentally sound uses by other Contracting Parties and not to impose restrictions that run counter to this objective'. While 'the principles of the CBD are finding their way into national laws and policies' (ten Kate 2002), those principles are not being implemented uniformly. The ABS laws and policies developed under the CBD have created a complex scenario for access and exchange of biological resources (Carrizosa 2004b). Referring to the CBD, Jon Daly, a curator of Amazonian botany at the New York Botanical Garden commented, 'Something that was well intentioned and needed has been taken to an illogical extreme.' (Revkin 2002). In the entire Pacific Rim region, national ABS laws and policies have approved 15 projects in Costa Rica, three in Mexico, two in the Philippines, one in Samoa, and one in the USA (Brush and Carrizosa 2004). Taking into account that all 15 projects approved in Costa Rica occurred *outside* of the Law of Biodiversity and that the three programs in Mexico have been terminated, the trend is clear. The absence of any approved, commercial biodiscovery projects in the Andean countries regulated under Decision 391, a region that may collectively harbor the largest proportion of the world's biodiversity, shows the same tendency (Grajal 1999).

A recent study of the Pacific Rim countries indicated that 'the most successful bioprospecting projects were established outside of focused national frameworks corresponding to the CBD' (Brush and Carrizosa 2004) and that 'In synthesis ABS laws and policies developed under the umbrella of the CBD have created a complex and comprehensive scenario for exchange of genetic resources.' (Carrizosa 2004b). If the CBD is to have its intended effect of creating conditions to 'facilitate access to genetic resources for environmentally sound uses', the evidence to date suggests that a far greater effort must be made to accommodate the needs of the practitioners that seek to access biological resources.

7.3.3.1 Contracts as tools for building bridges between the participants in biodiscovery research

The preceding discussion provides examples of the operational and conceptual difficulties in implementing a functional ABS system under a centralized system of laws and policies. Given that biodiscovery is a research-intensive process and that the research programs are inherently variable and dynamic, it is clear that more flexible legal devices are required if biodiscovery research programs that are international in scope are to succeed. During the development of the contractual agreements for the Panama ICBG, described below, it was found that the process of drafting legal agreements was a valuable experience for the parties involved, providing the opportunity to clarify misunderstandings, resolve differences, and define shared objectives, all in the context

of a document that is legally enforceable. Alternatively, when there are fundamental differences between parties that are considering working together, the process of drafting an agreement makes those differences clear. The current difficulties in establishing biodiscovery research programs in Latin America suggest that more flexible and straightforward policies should be considered by host countries. Contractual agreements may be the most appropriate mechanism for providing control over the access to biological resources while avoiding excessive restrictions and bureaucracy.

7.4 The Panama ICBG: Investing in the host country in order to maximize its role in the drug-discovery process and to link the research to conservation

The overall goals of the Panama ICBG are to: (i) discover new lead compounds from Panamanian plants, algae, and marine invertebrates for the treatment of several tropical diseases and cancer; (ii) to carry out that research in a way that is inextricably connected to the development of scientific training, capacity building, and development of scientific infrastructure; (iii) to develop techniques that facilitate drug-discovery research in developing countries; and (iv) to develop programs that promote biodiversity conservation in a manner that strengthens host-country institutions. There have been two five-year cycles of funding for the Panama ICBG, the first from 1998 to 2003 and the second from 2003 to 2008.

7.4.1 Context of ABS issues in Panama at the beginning of the Panama ICBG

The Panama ICBG was initiated in 1998, shortly after the adoption of Decision 391 in 1996 and when substantial international attention was focused on Costa Rica's positive experience with INBio and its commercial collaborators. During the same period, the institution responsible for access and use of biological resources in Panama at that time, the National Institute for Natural Renewable Resources (INRENARE), was elevated in status from an 'Institute' to an 'Authority', now known as the National Authority of the Environment (ANAM, Autoridad Nacional del Ambiente). The law which created ANAM and which defines its responsibilities is Law 41 of 1998, the General Law of the Environment (GLE) (La Asamblea Legislativa 1998). ANAM is represented before the Executive Branch by the Ministry of Economy and Finance. The GLE defines 'Prospecting or Biological Exploration' as 'The exploration of natural wild areas in the search of species, genes or chemical substances from biological resources, in order to obtain medicinal, biotechnological or other products.'

According to Article 71, 'ANAM is the competent authority, as established in the present law and its implementation, to establish norms and regulations and control access and use of biogenetic resources in general, with the exception of human species, respecting the rights of intellectual property. To comply with this function, legal instruments or economic mechanisms shall be developed and introduced. The right to use natural resources does not allow its owners to use the genetic resources contained within them.' Also relevant to the Panama ICBG is the country's system of protected areas. Article 66 of the GLE established a National System of Protected Areas (SINAP) made up of all of the protected areas established by laws, decrees, resolutions, or municipal agreements, all of which are regulated by ANAM. Article 94 of Chapter 10, entitled 'Coastal-marine and Wetland Resources', establishes that the use, management, and conservation of coastal-marine resources shall be subject to the regulations issued by the Panama Maritime Authority. Significantly, 'In the case of Protected Areas with coastal-marine resources under the jurisdiction of ANAM, regulations shall be issued by that authority'. Accordingly, the most obvious course of action for biodiscovery research in Panama was to establish a contractual agreement with ANAM that is consistent with the CBD and the GLE, the terms of which are described below.

7.4.2 Overview of the Panama ICBG drug-discovery process

Perhaps the greatest distinction of the Panama ICBG compared to the majority of natural products-based drug-discovery programs is the degree to which the host country plays an essential role in the drug-discovery process (Capson *et al.* 1996, Kursar *et al.* 1999, Coley *et al.* 2003). Departing from the traditional model in which the primary role of the host country is to provide the raw materials for drug discovery to collaborators in industrialized countries, the program has placed a major emphasis on strengthening scientific research capacity in Panama by complementary investments in the training of young scientists, in the creation of research opportunities for scientists in Panama, and in scientific infrastructure. The program has placed a premium on transferring, developing, and implementing technology that is practical for developing countries. The Panama ICBG utilizes an extended network of collaborators from academic institutions and the pharmaceutical industry in the USA, allowing the project to: (i) broaden the scope of the research by incorporating techniques and expertise not otherwise available; (ii) focus resources and strengths on well-defined immediate and long-term objectives that can be practically implemented in Panama; and (iii) provide first-class training opportunities for Panamanian students and researchers.

Conceptually, the drug-discovery component of the Panama ICBG is similar to many biodiscovery programs based in industrialized countries: the scientists involved in the program are involved in the collections of biological materials, bioassays and bioassay-guided fractionation, resulting in the discovery of discrete chemical compounds, preferably novel, and with activity against a clinically or economically important disease. The model is identical to that described above that resulted in the discovery of discodermolide (Sennet *et al.* 2002), dolastatin-10 (Simmons *et al.* 2005), and the hemiasterlins (Andersen *et al.* 1997). In this model, the scientists that played a key role in the discovery are recognized as 'inventors' of any IP that is generated. In this case of the Panama ICBG, the inventors are primarily the host-country scientists.

7.4.3 Associate programs in the Panama ICBG

There are currently six institutions involved in the Panama ICBG, which participate in a total of four Associate Programs and an administrative entity based in Panama known as Central Operations. The programs are based in Panama and the USA. Central Operations, based at the Smithsonian Tropical Research Institute (STRI) is responsible for the drafting of legal agreements for the ICBG, coordination with the Panamanian government, and ensuring a consistent flow of samples and data and other administrative responsibilities. Associate Program 1, coordinated through STRI, is responsible for coordination, administration, collections of plants, cultivation of endophytic fungi, and extraction. Associate Program 2 conducts assessments of bioactivity against parasites and cancer, and is currently carried out in the laboratories of the Institute of Advanced Scientific Research and High Technology Services (INDICASAT) and the Novartis Institutes for Biomedical Research (NIBR). Efforts are currently underway to incorporate Dow AgroSciences into Associate Program 2. Associate Program 3 is carried out at Oregon State University, the Scripps Institution of Oceanography, INDICASAT, and the University of Panama. This Associate Program carries out the fractionation and structural elucidation of the biologically active components from cyanobacteria, plants, and endophytic fungi. The roles of Associate Program 4 are to link the drug-discovery activities of the Panama ICBG with biodiversity conservation, to isolate and characterize marine natural products from marine invertebrates, and to carry out research and conservation activities in the Coiba National Park, as described below.

7.4.4 Organisms collected by the Panama ICBG

The collecting strategy for the first five-year cycle of the program involved terrestrial plants. The plant collecting efforts focused on young leaves, based on the theory that young leaves, being subjected to greater levels of herbivory than mature leaves, have higher levels of secondary metabolites (Coley *et al.* 2003). The materials collected are subjected to biological assays in the INDICASAT laboratories (described below) and additional collections are made only when the combination of results from biological assays and scientific literature suggests that recol-

lections are warranted. A biological assay-driven process was used to select plants for subsequent studies, leading to the identification of a number of chemical compounds with significant activity against cancer (Hussein *et al.* 2003, 2004, 2005, Rodríguez *et al.* 2003), leishmaniasis (Montenegro *et al.* 2003), and Chagas' disease (Torres-Mendoza *et al.* 2003, 2004, Chérigo *et al.* 2005). Nevertheless, the bioassay-driven purification process often led to plant species and genera that had already been the studies of numerous investigations, minimizing the possibility of isolating novel lead compounds, a major goal of natural products-based drug discovery. Accordingly, for the second five-year cycle, less-studied organisms more likely to yield novel biologically active compounds were incorporated. For terrestrial collections, the emphasis has shifted from plants to endophytic fungi, microorganisms that live within the tissue of living plants and which are relatively unstudied as potential sources of novel natural products (Strobel *et al.* 2004).

Marine organisms have also been incorporated into the Panama ICBG, principally cyanobacteria and soft corals, both of which are rich sources of biologically active natural products (Paul and Puglisi 2004). Most recently marine actinomycetes, a well-known source of biologically active metabolites (Magarvey *et al.* 2004), have been incorporated. Cyanobacteria have been among the richest aquatic or marine sources of new clinical candidates for the treatment of cancer, the best-known example of which is dolastatin 10, a potent anticancer compound which is currently in Phase II clinical trials (Simmons *et al.* 2005). Collections are carried out only by experts in their respective fields, ensuring that the collections have no significant biological impact, a particularly important consideration in the case of organisms such as corals (Guzman *et al.* 2004). To date, publications have been generated from studies of soft corals (Gutiérrez *et al.* 2004, 2005b, 2006) and sponges (Gutiérrez *et al.* 2005a) and, most recently, from cyanobacteria (Simmons *et al.* 2006).

7.4.5 Disease targets selected by the Panama ICBG: Technology transfer and development for bioassays

An essential and unique element of the Panama ICBG is the ability to carry out a range of biological assays in the host country. The Panama-based bioassays allow the program a degree of autonomy and productivity that would not otherwise be available, and easily justify the significant investment in time and money necessary to establish and maintain them. Academic collaborations played an important role in the establishment of the bioassays in Panama. A suite of bioassays for diseases of importance to both industrialized countries as well as developing countries was selected in order to enhance the impact of the program and to increase the probability of finding natural products of interest. The choice of bioassays has also been dictated by the cost, practicality, reliability and interest in avoiding the use of radioactive isotopes. From the beginning, the Panama ICBG benefited from the participation of experts in tropical parasitic diseases, which was essential for the development of the tropical disease bioassays. During the first five-year cycle, the bioassay targets included cancer, HIV, the parasites responsible for leishmaniasis, Chagas' disease and malaria, and the agricultural pest, whitefly (*Bemisia tabaci*). The HIV bioassay was established in collaboration with the NCI AIDS Drug Screening and Development Laboratory and utilized a non-infectious strain of HIV that can be used in standard laboratory facilities (Kiser *et al.* 1996). The assay for HIV proved to be costly and labor intensive and was eventually abandoned. Efforts to develop a bioassay based upon the whitefly were unsuccessful, and it was not included in the second five-year cycle.

7.4.5.1 Drug discovery for cancer

The bioassays established in collaboration with the NCI include breast, lung, and central nervous system cell lines (Monks *et al.* 1991). The NCI provided the cell lines and the non-infectious HIV bioassay described above at no cost and helped organize a workshop in Panama on their use. The NCI routinely sponsors visits by scientists by collaborating host countries to participate in collaborative research and training opportunities (Hallock and Cragg 2003) and did so in the case of the Panama ICBG. The colorimetric bioassay used with the tumor cell lines measures cell death and thus provides a measure of the cytotoxicity of the test substance. The cell line and assays were initially established in the Center for Pharmacognostic Research on the Panamanian Flora (CIFLORPAN) at the University of Panama. For the second five-year cycle, the cancer cell line assay was transferred to INDICASAT, which is now responsible for all of the Panama-based biological assays. The tumor cell

lines have been used to characterize a variety of cytotoxic compounds, all derived from plants (Hussein *et al.* 2003, 2004, 2005, Rodríguez *et al.* 2003).

7.4.5.2 Collaboration with the Novartis Institutes for Biomedical Research

Another key element to the anticancer drug-discovery component is provided by the collaboration with NIBR. During the first five-year cycle, negotiations with the Monsanto Corporation were prolonged and ultimately unsuccessful. With initial assistance from the NCI, the NIBR joined the Panama ICBG, and the collaboration has continued through the second five-year cycle. The primary benefit of the NIBR collaboration is the access to their mechanism-based oncology bioassay program that relies upon state-of-the-art knowledge of cancer cell biology along with HTS to find mechanism-based anticancer lead compounds. The mechanism-based anticancer assays are the ideal complement to the whole-cell assays described in the previous section and which are performed in Panama. The cell line assays provide a general indication of cytotoxicity to the tumor cell lines without providing specific information about how the test substances may work. By contrast, the mechanism-based bioassays provide information about specific targets within cancer cells. The sensitivity of the NIBR HTS bioassays to compounds such as tannins often result in false positives and requires that all crude samples first undergo a pre-fractionation protocol as described in the earlier section '*Bioassay-Guided Fractionation and the Isolation and Characterization of Compounds*'.

7.4.5.3 Drug discovery for malaria

The establishment of a permanent culture of the malaria-causing parasite, *Plasmodium falciparum,* and the development of an efficient and cost-effective anti-plasmodial bioassay that does not require the use of radioactive isotopes has been one of the single largest investments in time and financial resources for the Panama ICBG. Collaborators from the Walter Reed Army Institute of Research and the General Clinical Research Center at the University of California at San Francisco played crucial roles in training of a Panamanian researcher in the cultivation of *P. falciparum.* The standard bioassay for screening potential drugs for antiplasmodial activity is a radioactivity-based method that relies upon the incorporation of [^{3}H]hypoxanthine into the parasite's DNA in order to measure parasitic replication in erythrocytes (Corbett *et al.* 2004). The method is sensitive and it can be used to screen a large number of compounds, but employs hazardous radioactive materials that require special facilities and procedures.

Accordingly INDICASAT researchers developed an alternative method of testing *Plasmodium* susceptibility to potential antimalarial agents that utilizes PicoGreen®, an ultrasensitive fluorescent nucleic acid stain which enables the detection of exceedingly small quantities of double-stranded DNA with a moderately priced microfluorimeter. The assay takes advantage of the fact that the erythrocytes in which the parasites are cultivated have no DNA, and therefore do not interfere with the analysis of parasitic DNA. The development of a novel, straightforward, efficient, and accurate method for the detection of potential antimalarial agents based upon a fluorimetric technique marks a significant accomplishment for the INDICASAT laboratories and the Panama ICBG (Corbett *et al.* 2004). The development of a microfluorimetric method is likely to find wide application, especially in other developing nations that also contend with logistical problems when using radioactive isotopes. To date, INDICASAT scientists have trained researchers from Madagascar and Bolivia in the cultivation the parasite and the use of the fluorescent bioassay technique. The Malagasy scientists are associated with a Madagascar-based ICBG program and the FIC of the NIH provided the funds necessary for their training in Panama (D.G.I. Kingston, pers. comm., 2 February 2006). The bioassay technique was the subject of a provisional patent whose authors were participants in the Panama ICBG, but was provided at no cost and without restrictions to the Malagasy scientists.[8]

7.4.5.4 Drug discovery for leishmaniasis

There are significant problems associated with the development of an effective chemotherapeutic agent for leishmaniasis, among them the need to target the relatively insensitive intracellular (amastigote) form of the parasite (Croft and Yardley 2002). Initially work employed the extracellular (promastigote) form of the parasite

8 The incentives for seeking provisional patent protection for the microfluorimetric method for antimalarial drug discovery were twofold. First, should the technique prove to be of commercial value, provisional patent protection ensures that mechanisms can be developed that will ensure that a fraction of any revenues that result will return to the Panama-based institutions that own the IP. Second, ownership of the IP ensures that the technique can be made available at no cost to developing country scientists, as in the case of the Madagascar ICBG.

Leishmania mexicana since it is the form of the parasite most easily grown *in vitro* and it can be cultured in well-defined media in the absence of a host cell. A novel colorimetric assay was developed in the INDICASAT laboratories for the promastigote form (Williams *et al.* 2003) and was used by University of Panama-based participants to identify anti-leishmanial compounds in plants (Montenegro *et al.* 2003). The amastigote form of the parasite multiplies inside the host macrophages and is responsible for the disease manifestations in humans and should be the target of any novel treatment (Bates *et al.* 1992, Croft and Yardley 2002). Accordingly, INDICASAT researchers subsequently developed a novel microfluorimetric assay for the intracellular form of the parasite that employs PicoGreen®, which forms a fluorescent complex with the parasitic DNA as described above for the anti-plasmodial assay. As the parasites are grown in a cell-free environment there is no potential interference with cellular DNA and growth is measured with an inexpensive microfluorimeter in 96-well plates, a methodology similar to the anti-plasmodial bioassay described below. The Panama ICBG continues to search for compounds active against leishmaniasis. It is hoped that the genome sequence for *Leishmania major* will reveal new drug targets and facilitate the search for urgently needed treatments for the leishmaniases.

7.4.5.5 Drug discovery for Chagas' disease

To search for compounds active against *Trypanosoma cruzi,* the INDICASAT laboratories employ a colorimetric bioassay that utilizes a recombinant strain of the parasite that expresses the *Escherichia coli* ß-galactosidase gene (Buckner *et al.* 1996). Initially, a technique to evaluate the extracellular (epimastigote) form of the *T. cruzi* parasite was employed since the growth requirements and conditions of the culture are relatively straightforward. INDICASAT researchers have since established a bioassay with the more clinically relevant intracellular (amastigote) form that is now used routinely to evaluate potential anti-trypanosomal compounds. The colorimetric assay and the recombinant parasite were developed at the University of Washington and made available to INDICASAT researchers at no cost. The assay is performed in a 96-well plate and parasite growth is easily and accurately quantitated with a routine microplate reader. Chemists at the University of Panama utilized these bioassays to characterize novel compounds from plants with activity against the disease-causing parasite (Torres Mendoza *et al.* 2003, 2004). The recent sequencing of the genome of *T. cruzi* promises to open up a plethora of new drug targets (Cross 2005) but, as in the case of leishmaniases, there will remain a crucial need to isolate new lead compounds to test against those targets (Croft *et al.* 2005).

7.4.6 General investments in infrastructure and in research programs

During the first five-year cycle, the Panama ICBG supported, in whole or in part, three research programs at the University of Panama and a research program responsible for the bioassays of tropical parasites. The latter program was initially part of the Gorgas Memorial Institute and is now located at INDICASAT. Two of the research programs that were created during the first five-year cycle continue to receive support during the second cycle of funding, namely a laboratory involved in the bioassay-guided fractionation of natural products (Montenegro *et al.* 2003, Torres-Mendoza 2003, 2004) and the bioassay component of the INDICASAT laboratories (Williams *et al.* 2003, Corbett *et al.* 2004). Equipment purchases for Panama-based laboratories include high-pressure liquid chromatographs (HPLCs), fume hoods (for working with organic solvents and hazardous substances), microscopes, rotary evaporators, computers, laminar flow hoods (for working in sterile conditions), chromatography supplies, and other supplies. Another significant investment supported primarily by the Panama ICBG was a 300 MHz Bruker Avance NMR spectrometer which is housed at STRI. Independently, the National Secretary for Science, Technology, and Innovation (SENACYT) has made significant investments in scientific infrastructure and equipment in INDICASAT, which consists of a large, modern complex of offices, laboratories, and library facilities. The combined investments of the Panama ICBG and its host-country partner institutions have made a fundamental difference in the ability of Panamanian scientists to carry out biodiscovery research.

7.4.7 The training of students and creation of research opportunities in the Panama ICBG

The other pillar of host-country investment for the Panama ICBG has been in the training of students and the creation of research opportunities for Panamanian scientists. A total of 84 Panamanian students, scientists, and technicians have passed through the Panama ICBG practicing disciplines that include botany, natural products chemistry, molecular biology, parasitology, virology, and microbiology, performing the majority of the work essential to the program including plant collections, natural products chemistry, biological assays, and database management. Many of the students and young scientists have used the Panama ICBG as a springboard to graduate school. At this writing, 14 Panamanians are pursuing or have completed M.Sc. theses outside of Panama and three are pursuing Ph.D. degrees, two were recently accepted into Ph.D. programs in Europe, and one recent Ph.D. was awarded a full postdoctoral scholarship to study at the Scripps Institution of Oceanography. The number of trained students is the most significant legacy of the Panama ICBG and is the ideal complement to the investments in infrastructure discussed above.

7.4.8 The Panama ICBG and traditional knowledge

The first five-year cycle of the Panama ICBG included a program with the Naso indigenous group from northwestern Panama with the purpose of helping preserve their traditional ethnobotanical knowledge of medicinal plants. The program involved three groups of Naso students and teachers, one teacher per group and a total of 18 students, and ran for over three years. The program was terminated when most of the traditional knowledge of the Naso had been documented. The recorded information is the sole property of the Naso and was never studied or copied by any non-Naso participant in the Panama ICBG. While the agreement between ANAM and STRI for the Panama ICBG contemplated the possible use of traditional knowledge, the Naso's ethnobotanical knowledge was never utilized to guide plant collections. While there are several ICBG programs that have successfully used traditional knowledge to guide plant collections (Kingston *et al.* 1999, Soejarto *et al.* 2004), the experience of an ICBG program based in Chiapas, Mexico, led to the conclusion that the potential risk of negative publicity associated with the use of traditional knowledge was too great (Berlin *et al.* 1999). Known as the Mayan ICBG and initiated in 1998, the organizers went to extraordinary lengths to inform local participants of the nature of the research and of the potential benefits, including improvements in health care and an enhanced capability to use and conserve their disappearing biological resources and associated traditional knowledge (Rosenthal 2002). Nevertheless, the program was the subject of extraordinary negative publicity and was closed in October 2001 (Dalton 2001, Larson-Guerra *et al.* 2004). The negative publicity surrounding the Mayan ICBG has undoubtedly had a chilling effect on many legitimate biodiscovery programs (Rosenthal 2002).

7.4.9 Biodiversity conservation component of the Panama ICBG

7.4.9.1 Public outreach

Since the Panama ICBG's inception, program participants have engaged in over 200 outreach efforts that emphasize the link between biodiversity and human health and the benefits that the country has received by investments in scientific infrastructure, the training of students and the creation of research opportunities for local scientists. Many of the outreach activities were associated with the Coiba National Park as discussed below.

7.4.9.2 Collections in protected areas and collaboration with ANAM

ANAM is responsible for the management of Panama's extensive system of 41 protected areas, both marine and terrestrial, that collectively encompass 19.5% of the national territory. All collections of plants and marine organisms have been made in protected areas. The relationship is mutually beneficial for ANAM and the Panama ICBG in the following ways: (i) the Panama ICBG benefits from clearly defined terms of access to national territory under the sole jurisdiction of ANAM; (ii) the materials collected are subjected to the terms of the ANAM-STRI Agreement procedures; (iii) collections are made in areas that receive protection by the host country; and (iv) the Panama ICBG-sponsored research provides valuable information to ANAM about the area's biological diversity through its biodiversity inventory activities. For terrestrial plants, since the beginning of the program in 1998, a total of 3,099 samples have been collected from 1,877 species, representing 786

genera and 178 families. In addition to providing access to biodiversity inventories of its collections, the Panama ICBG developed in collaboration with ANAM a digital interface for preparing all permits utilized by the institution. Created at the request of ANAM's National Director for Natural Patrimony and designed by a systems analyst working for the Panama ICBG, the system facilitates all permit-mediated transactions, including concessions, scientific research, exports of biological materials, and determination of whether a given species is listed on the CITES database of endangered species. The Panama ICBG provided a computer that serves as an internal server, allowing the use of the system by ANAM personnel from anywhere in its administrative center.

7.4.9.3 The Coiba National Park: Providing scientific input to strengthen protected areas

In the second five-year cycle of the Panama ICBG, one of the four Associate Programs, titled 'Conservation, outreach and biodiversity inventory in Panama', was explicitly designed to link the drug-discovery activities of the Panama ICBG with substantive conservation measures and to develop and implement initiatives to promote the protection of the Coiba National Park. Located off the southwest coast of Panama in the Gulf of Chiriquí (Guzmán *et al.* 2004) and comprising an area of 2,700 km^2, the Coiba National Park includes a marine area of 2,165 km^2 and an insular area 535 km^2. It is located within the Tropical Eastern Pacific (TEP), a unique tropical marine region, one of the most isolated regions in the world's oceans, which has probably the highest rate of endemism of any equivalent region in the world. The Gulf of Chiriquí belongs to the section of the TEP with the greatest biological value (Sealy and Bustamente 1999). As a consequence, no other continental-shore marine park could do as much for marine conservation in the entire TEP as the Coiba National Park and its adjacent buffer zone of 1,600 km^2 (ANAM 2005). Coiba Island is located in the center of the park. With an area of 503 km^2, it is the largest tropical island on the continental shore of the Pacific coast of the Americas. Coiba Island retains 85% of its original primary forest, which harbors numerous endemic species and subspecies (Ibáñez 2001, Guzmán *et al.* 2004).

The Panama ICBG led an initiative to compile the existing information about the Coiba National Park and to conduct surveys with local fishermen in order to understand their fishing practices, perceptions about conservation of the park, and socioeconomic conditions. The information obtained on the park was presented to government officials and the public at large during a lengthy debate to establish the park by law (it was previously established by a weaker Executive Decree). One of the more effective arguments for the park's protection was the potential for scientific research; both basic research as well as biodiscovery, pointing out that the unique marine and terrestrial ecosystems constitute 'living libraries' for natural products-based drug discovery. Legislation was adopted for the Coiba National Park on July of 2004, the first law of its kind for the Republic of Panama (ANAM 2005). Starting in November of 2002, Panama ICBG members worked closely with ANAM to have the Coiba National Park inscribed into UNESCO's list of World Heritage Sites. In July of 2005, the Coiba National Park was formally inscribed, one of approximately 160 World Heritage Sites worldwide. The Panama ICBG is providing funding and personnel for the first complete botanical survey of the islands of the Coiba National Park. Preliminary studies of the flora of Coiba Island resulted in the discovery of a new genus (*Desmotes* in the family Rutaceae), endemic to Coiba, along with three endemic species (Ibáñez 2001). The interior section of the island is largely unexplored and will likely yield additional endemic taxa. All data from the Panama ICBG-sponsored botanical survey of the Coiba National Park will be made available to ANAM, which is in the process of developing a new management plan for the park. Panama ICBG support has also provided support for taxonomic research in the Coiba National Park's marine environment. Partial support for a sponge taxonomist resulted in the identification of a new species of sponge, *Aplysina chiriquensis*, from the park (Diaz *et al.* 2005). To counter the difficulty in obtaining funds for botanical surveys or taxonomic research in general (Wheeler *et al.* 2004), biodiscovery research can help provide the badly needed financial support.

7.4.9.4 Conclusion: Linking biodiscovery research to biodiversity conservation

It has proved challenging to explicitly link biodiscovery research to the conservation of biodiversity. This is due in part to the nature of conservation work: success does not usually result in a concrete 'product' but is rather a combination of actions, attitudes, and regulations that promote the protection of a given area or species

within that area. It is widely recognized that there are insufficient funds necessary to protect all of the world's threatened species, in either terrestrial or marine habitats (Myers *et al.* 2000, Roberts *et al.* 2002). Accordingly it is crucial to explore mechanisms whereby funds available for complementary activities, such as biodiscovery research, can promote biodiversity conservation. Biodiscovery research is one of several vehicles through which a biodiverse country can capitalize upon its natural heritage, using it as a comparative advantage to attract funds to strengthen host-country research programs. When employment and educational opportunities are linked to biodiversity, an ineluctable consequence is an enhanced appreciation for biodiversity. Under appropriate circumstances a direct link between human health and biodiversity can be made, as described above for the Coiba National Park. Cabrera-Medaglia (2004b) indicated that in the case of Costa Rica, the fraction of money from drug discovery is significantly less than that derived from tourism activities. But ecotourism does not train scientists, provide investments for scientific infrastructure, or provide future treatments for diseases whose impact is greatest in the developing world. In any event, the Costa Rica example clearly demonstrates that both enterprises are compatible if not complementary. To dismiss the potential impact of biodiscovery research on biodiversity conservation by virtue of a 'pharmaceutical researcher's willingness to pay for biodiversity as an input into commercial products' (Simpson *et al.* 1996) assumes that the role of the host country is limited to providing biological resources as a commodity and ignores the potential benefits to be gained by its participating as a partner in biodiscovery research.

7.4.10 Access and benefit-sharing contracts utilized by the Panama ICBG

7.4.10.1 First-generation access and benefit-sharing contracts for the Panama ICBG: The hub-and-spoke model

As described above, access and use of biological diversity in Panama is currently defined by the GLE (Law 41 of 1998). Accordingly, a suite of legal agreements for the Panama ICBG were developed that met the following basic requirements: (i) consistency with the spirit and letter of the GLE and the CBD; (ii) a model that anticipated the substantive development of the host country in biodiscovery research; (iii) equitable benefit sharing for all of the partners concerned; (iv) clearly defined provisions for the collection and transfer of biological samples; (v) clearly written and easily understood; and (vi) practical to implement. Material Transfer Agreement (MTA) templates that were developed elsewhere were initially explored (Putterman 1996), but it was decided to develop *sui generis* contracts that could be tailored for the circumstances in Panama. Many of the standard contractual elements ('legal boilerplate') that are present in the legal agreements of the Panama ICBG have been published elsewhere (Gollin 2002a).[9]

The Panama ICBG currently operates with a series of coordinated two-party agreements. The main advantage of this arrangement, known as the 'hub and spoke model' (Gollin 2002b), is that bilaterial agreements are easier to negotiate and to change if the parties or terms change during the life of the agreement. As the recipient of the ICBG Program award and as a consequence of the program's original design, including the contractual arrangements, STRI is the 'hub' institution. Ensuring consistency between the different agreements proved to be straightforward and imposed no significant burden during the negotiations or during the implementation of the program. There are three primary disadvantages of this model: (i) the hub institution must carry the burden of the negotiation and coordination between the contracts (Gollin 2002b); (ii) by negotiating bilateral agreements, one loses the opportunities to have all of the parties work together and simultaneously; and (iii) any one of the parties in a two-party agreement is more vulnerable to criticism than if there were a consortium of institutions involved.

9 *Sui generis* contracts have been chosen by many investigators (Gollin 2002b). During the development of the agreements for the Panama ICBG, input was received from Michael Gollin of Venable LLP who ensured that the agreements were drafted in a manner that was enforceable, coherent, and internally consistent and that they contained the basic elements present in contractual agreements of this nature.

7.4.11 Elements of the ANAM-STRI agreement for the Panama ICBG

Beyond the provisions of the GLE, the primary legal framework for the Panama ICBG was established by the agreement between ANAM and STRI (ANAM-STRI Agreement). All subsequent two-party agreements negotiated for the program are consistent with the terms of this agreement (Capson 2002a, Gollin 2002a).

7.4.11.1 Key concepts and definitions specified in the agreement

While the agreement does not cite any articles of the CBD in particular, the ANAM-STRI Agreement explicitly acknowledges its consistency with the CBD. Standard concepts such as access fees (i.e., fees paid by an industrial collaborator, often annually, that are independent of any funds from the development or commercialization of any product) (ten Kate and Laird 1999), intellectual property, milestone payments, and net revenue were explicitly defined. The definition of 'Materials' is broad in order to ensure that any biological materials collected, even inadvertently, falls under the terms of the agreement (e.g., microbes). Materials are defined as 'Any biological substance, either in whole or in part, which is collected under this Agreement. Examples include, but are not limited to, plants, insects, microbes, and uncharacterized organisms such as microbial life present in samples or parasites transferred adventitiously, and extracts, derivatives and preparations thereof.'

In defining 'Derivatives', the intention was that any chemical compound derived from Materials, *as well as any informational content that those compounds may contain*, are subject to the terms of the ANAM-STRI Agreement. Derivatives are defined as 'Any discrete chemical compound that has been obtained from Material, an analog of such a compound, a synthetic counterpart to such compound, a variant that is structurally based on the compound or that is otherwise produced using in substantial part information contained in, or conveyed by, the Material, and genetic material able to express such compounds.' If a pharmaceutical agent is developed from material originally collected by the Panama ICBG, even if it is entirely synthetic, it is still subject to the terms of the ANAM-STRI Agreement.

The ANAM-STRI Agreement specifies that collaborations between STRI and each collaborator shall be formalized through an individual agreement, a copy of which shall be made available to ANAM. Institutions that collaborate with STRI for the Panama ICBG are classified as Industrial Collaborators, Noncommercial Collaborators, or Panamanian Collaborators. Noncommercial Collaborators are defined as 'Any public institution, scientific or research institution or a not-for-profit organization working in collaboration with STRI as part of the ICBG'. During the first five-year cycle, non-Panamanian academic collaborators played essential roles in the Panama ICBG through technology transfer and training of students, but they were not involved in research activities involving the use of biological materials. Panamanian Collaborators are a subset of Noncommercial Collaborators that are based in Panama. As described above, researchers in Panama-based institutions played the primary roles in the research activities and were the only institutions included in revenue-sharing provisions. As described below in the section '*Evolution of the Panama ICBG*', that situation has changed. While ANAM's permission is not required for STRI to enter into collaborative agreements for the Panama ICBG, in practice, for each Industrial Collaborator that is incorporated into the Panama ICBG, ANAM's recognition is obtained in writing. Significantly, ANAM has the final word in these arrangements as they approve the export of each sample sent outside of Panama for the Panama ICBG.

7.4.11.2 Procedures for the collection and testing of biological materials

In particular, STRI agrees to minimize environmental impacts while collecting biological materials and to avoid the collection of any materials known to be rare or endangered. STRI also pledges to solicit permission for any re-collections of a quantity greater than 100 grams dry weight. Standard ANAM collecting permits are utilized by the Panama ICBG for the collection of both marine and terrestrial samples.

7.4.11.3 The use of traditional knowledge

The ANAM-STRI Agreement stipulates that collections based on traditional knowledge would only occur 'with the express prior written consent of the appropriate competent governing authorities, where such a governing authority exists, and in a manner that ensures the equitable sharing of benefits that arise from traditional knowledge'. The contract stipulates that 'institutions or organizations offering traditional knowledge, such groups, institutions

or organizations may participate as Panamanian Collaborators', meaning that representatives of groups offering traditional knowledge would participate in the Panama ICBG with the same status as the Panamanian Collaborators participating from Panamanian academic or governmental institutions. For reasons described above, the Panama ICBG has never utilized traditional knowledge to guide the collection of biological materials for drug discovery.

7.4.11.4 Procedures for obtaining ANAM's authorization for use, transfer, and export of biological materials

The intention of this clause was to streamline procedures for the authorization to use, transfer, and export the biological materials collected under the ANAM-STRI Agreement. Once material was 'authorized', STRI would be able to use the material for research, transfer materials within Panama, and export the biological materials to collaborators outside the country, without the need to obtain additional authorization from ANAM. This provision would have applied only to the Panama ICBG and would have added a novel administrative procedure for ANAM in addition to creating a new category of biological materials. This procedure proved impractical and, by mutual agreement, conventional ANAM permits for exporting biological materials have been used. The materials that are exported are indicated by their scientific names (when known) and each carries a unique code.

7.4.11.5 Establishment of an environmental trust fund

The ANAM-STRI agreement anticipates the establishment of an Environmental Trust Fund, designated by mutual agreement between ANAM and STRI, 'for the purpose of biodiversity conservation and to support sustainable uses of biodiversity, including biodiversity prospecting, in the Republic of Panama' (Capson 2002b). The fund is to be administered by a local foundation, *Fundación Natura*, whose mission is 'to promote natural resource management in Panama, particularly through the financing of projects that promote the conservation of biological diversity, environmental protection and sustainable development in Panama, and by strengthening the capacity of the institutions and organizations that implement those projects' (Fundación Natura 2006). Specifically, the trust fund would be used to 'support projects, studies, institutions and individuals that promote the understanding, conservation, protection and/or sustainable use of biological diversity throughout the Republic of Panama'. The recipients of grants from this fund will include nongovernmental organizations and individuals. Since there has been no money from either access fees or from the development of any compound developed by the Panama ICBG to date, the fund has not been established. However in light of the probable incorporation of Dow AgroSciences into the Panama ICBG, which will result in the generation of access fees, it is anticipated that the fund will be established in 2007.

7.4.11.6 Distribution of net revenue and access fees

This clause in the ANAM-STRI Agreement describes the distribution of revenues among the Panama-based institutions of the Panama ICBG. The largest share of any revenue (30%) would flow to the Environmental Trust Fund, the second largest share (20%) would flow to a fund managed by ANAM, and the remaining 50% would be split in equal shares among the Panama-based Collaborators to the Panama ICBG (as defined above), irrespective of their relative contribution to any invention that generated the intellectual property. The latter provision was designed to promote a spirit of collaboration among Panama-based researchers in which information, data, and ideas are freely shared. As the revenues derived from Access Fees were expected to be relatively small (e.g., US$25,000 to 40,000) they are divided between fewer participants, namely, the Environmental Trust Fund (40%), ANAM (30%), and STRI (30%) with the stipulation that the latter portion be spent 'to support research and conservation activities in the Republic of Panama'.

7.4.11.7 Management of intellectual property

It was originally envisioned that STRI would manage the IP generated by STRI and its Panamanian Collaborators associated with the Panama ICBG. The motive was one of expediency: it was anticipated that it would be far easier for one institution to manage IP for the program than multiple institutions. The ANAM-STRI Agreement stipulates: 'It is contemplated that STRI shall own IP, or manage IP shared with Non-Commercial Collaborators, including the obligation to incur expenses for the filing and maintenance of patents, and responsibility for licensing Intellectual Property to provide revenues.' In practice, this clause was sometimes misconstrued to mean that STRI shall uniquely 'own' all of the IP associated with the Panama ICBG (in fact, the IP generated to date through the Panama ICBG has been shared be-

tween investigators from STRI and Panama-based institutions). Contractual agreements drafted in the future for the Panama ICBG are likely to specify that ownership and management of IP shall be decided collectively by all of the institutions involved in the generation of the invention.

7.4.11.8 The influence of science and technology on contract negotiations

As a research-driven program, the application and development of the necessary and appropriate technology for the Panama ICBG has played a major role in the design and implementation of the program, including the contracts that were negotiated between the participating parties. For example, the contractual arrangements between STRI and the Panamanian research institutions involved in the program took into account the techniques that could be performed in Panama for the *in vitro* testing of biological materials for antiparasitic and anticancer properties and the isolation and characterization of biologically active chemical compounds. In the contract between STRI and the University of Panama, the parties commit to the training of Panamanian university level students and postdoctoral scientists, including 'the use of biological assays, data analysis, methods of analysis and purification of proteins and organic compounds, and other applicable scientific methods and techniques'. The language in the ANAM-STRI Agreement is consistent with the contracts between STRI and its Panama-based academic collaborators, and recognizes that STRI will commit to 'transfer knowledge, expertise, technology and materials' related to the research activities described above. In some cases, the contemporary technology necessary for the Panama ICBG was unavailable for practical or proprietary reasons, for example, the screening methodologies utilized by NIBR, and contracts were developed that permitted their incorporation into the Panama ICBG under well-defined terms.

The design of the program anticipated that host-country participants would generate publications and IP. Accordingly, all of the contractual agreements for the Panama ICBG address the ownership and management of IP and recognize the willingness of the participants to work cooperatively to publish the results of the research. The significant role of host-country scientists in the Panama ICBG, which is reflected in all of the contractual arrangements for the program, has had a fundamental impact of the way the program has been perceived by government officials, scientists, students, and the public at large, a perception from which the program has consistently benefited.

7.4.12 The essential role of USA- and Europe-based academic and governmental collaborators for technology transfer and development for the Panama ICBG

During both five-year cycles of the Panama ICBG, academic collaborators have played crucial roles in the transfer of materials and technology and by providing training opportunities. Examples of biological materials obtained through collaborations include the cancer cell lines (Monks *et al.* 1991), the non-infective HIV assay (Kiser *et al.* 1996), the recombinant *Trypanosoma cruzi* parasite that expresses the *Escherichia coli* ß-galactosidase gene (Buckner et al. 1996), and strains of the *Leishmania* sp. parasite. Most of the cell lines and parasites are proprietary and made available through MTAs. During the first five-year cycle of the Panama ICBG, Panamanian scientists trained in laboratories in Mexico, Spain, and the USA in a range of techniques including the bioassay-guided isolation and characterization of natural products with activity against cancer cell lines or tropical parasites and the cultivation of the malarial parasite. Without this transfer of technology and the availability of proprietary materials and training opportunities, the program would not have much of its current Panama-based research capability. During the second five-year cycle, the program has relied less on transfers of technology and materials, but continues to benefit from training opportunities in the USA.

7.5 Evolution of the Panama ICBG

As could be expected of any complex and multi-institutional biodiscovery program, the Panama ICBG has evolved over the past seven years. The overall program goals remain the same but the program has grown more focused by eliminating elements that were either unsuccessful or peripheral to the basic mission of drug discovery and conservation. Collections of biological materials now include organisms that are more likely to yield novel biologically active compounds, for both marine (cyanobacteria and soft corals) and terrestrial (endophytic fungi) collections. Accordingly, the reliance on terrestrial plants has decreased. While maintaining a focus on research, capacity building, and biodiversity conservation in Panama, the program has benefited from the involvement of established marine natural products chemists from the Scripps Institution of Oceanography, increasing the level of sophistication of the chemistry component and bringing the expertise of decades of research in multi-institutional, international drug-discovery research.

While the first generation of legal agreements for the Panama ICBG utilized the hub-and-spoke model, the subsequent round of agreements is likely to incorporate elements of the 'consortium' contractual model, the advantages of which were discussed above. The experience gained by the earlier contractual arrangements will be incorporated into the next round of agreements. As described below in the section '*The Changing Landscape for Biodiscovery Research in Panama*', ANAM plans to implement a new set of ABS regulations in the near future. Those regulations will affect all of the contracts associated with the Panama ICBG in ways that are unclear at this writing.

7.5.1 Addition of new disease targets

INDICASAT researchers are working on the development of a novel fluorescence-based *in vitro* biological assay for detection of substances with activity against the dengue virus that can be performed in 96-well plates. The global prevalence of dengue has grown dramatically in recent decades: some 2.5 billion people are now at risk from dengue. An estimated 500,000 cases of dengue hemorrhagic fever, a potentially lethal complication, require hospitalization each year; many of these victims are children. There is no specific treatment for dengue fever (World Health Organization 2006).

7.5.2 The changing landscape for biodiscovery research in Panama

The landscape for scientific research within Panama has also evolved during the life of the Panama ICBG and will likely continue to do so. There is a clear recognition by members of the government, in particular SENACYT, that biological diversity that is accessible on practical and equitable terms provides Panama with a comparative advantage internationally for both basic and applied research, including biodiscovery. That research can, in turn, promote economic growth and help secure the country's health by finding treatments for diseases of national importance. The current SENACYT administration is actively pursuing a science and education agenda that continues to invest in scientific infrastructure by substantial increases in the number of grants for scientific research (the only peer-reviewed grants in the country) and by providing opportunities for graduate and postdoctoral scientists and education professionals at all levels to study abroad. Of the students and young scientists that are currently undergoing training outside of Panama, some are likely to pursue academic careers within Panama. Combined with scientists that have been trained overseas through the CIFLORPAN facilities at the University of Panama, they are likely to contribute to substantial changes in Panama's scientific landscape.

As described above, ANAM is responsible for developing the appropriate 'legal instruments and/or economic mechanisms' in order to regulate and control the access and use of biological resources in Panama. At this writing, ANAM is in the process of developing regulations for those purposes. It is hoped that the experience obtained through the design and implementation of the Panama ICBG, by both practitioners of biodiscovery research and the officials that regulate those activities, will prove beneficial. Irrespective of the outcome of those regulations, due in part to the Panama ICBG, the envi-

ronment in which the regulations are being developed is characterized by a significant degree of cooperation between academic and governmental institutions within the country, in recognition of the fact that all of the institutions, and the constituencies that they serve, will be affected by the outcome.

7.5.3 South-south technology transfer

Pending the availability of additional funds, the South-South training component of the Panama ICBG will be enhanced, in particular with respect to biodiscovery research for treatments of tropical parasitic and viral disease. By providing training opportunities to developing country scientists, it is hoped that the program will help promote equitable biodiscovery research in countries where that research is either absent or significantly restricted. The collaboration between the ICBG programs in Panama and Madagascar, discussed above in the section '*Drug Discovery for Malaria*', provides a particularly relevant example of productive South-South training and technology transfer.

Conclusions

Panama provides an example of how a biodiversity-rich country can benefit by participating in biodiscovery research. Panama's participation in an international collaborative drug-discovery program helped contribute to the development of an integrated biodiscovery program that includes a guided collection strategy, a unique suite of bioassays, and the facilities and equipment that permit the bioassay-guided fractionation and characterization of compounds that are active against important disease targets. Funds from the Panama ICBG have been complemented by investments from the host-country government. The Panama ICBG has proved to be an excellent vehicle for training young scientists, who then use that experience to advance their scientific careers. In effect, Panama has leveraged its biodiversity under highly advantageous terms and invested in education and in the country's scientific infrastructure. Provided the program remains productive and internationally competitive, funds for the continuity of drug-discovery research are likely to come from any of a number of international funding agencies.

Applying the experience in Panama in other settings

The biodiscovery program in Papua New Guinea (described as a case study in the section '*Case Study: The University of British Columbia and Papua New Guinea and the Development of the Hemiasterlins*') provides an informative contrast. While Papua New Guinea is not currently in a position to maintain the scientific apparatus present in Panama, by partnering with academic colleagues that can isolate and characterize biologically active natural products with the potential to treat disease, Papua New Guinea has received significant financial benefits that are being invested in the country's scientific infrastructure. The examples from Panama and Papua New Guinea share four important elements. First, both are heavily dependent upon international collaborations. Second, the drug-discovery programs involving both countries produce discrete chemical compounds that are chemically and biologically characterized. Both programs offer to their pharmaceutical partners a value-added product that can be recognized as IP and protected by international patents: the major difference is the degree of involvement of the academic partner from the developed country. Third, both programs were allowed to proceed in the absence of excessive national regulations that could have otherwise discouraged practitioners or potential donors. Fourth, the working relationships between the collaborating partners, including the pertinent government authorities, were transparently defined by contracts. Panama and Papua New Guinea differ significantly in terms of indigenous scientific capacity and the social and economic conditions that permit long-term scientific research, nevertheless, both countries have benefited by participatory biodiscovery research.

The other examples cited above provide informative comparisons but for different reasons. Costa Rica once utilized contractual models to regulate access to biological resources and to define the terms of biodiscovery programs, and is now attempting to do the same with

national legislation. The regional and national legislation that regulates access to biological resources and biodiscovery research in Colombia has, in effect, created circumstances that are not conducive to participation in international biodiscovery research. In the context of Latin America, where the development of the functional legal and contractual mechanisms for biodiscovery research has created significant challenges, it is hoped that the experience in Panama will prove useful for both policy makers and researchers.

In other settings, the experience in Panama may prove most useful in the context of science and technology. In the case of Africa, as the world's poorest continent, a considerable amount of media attention in both the lay and scientific press has been directed towards the need to develop indigenous science and technology (Nature 2005a, 2005c). Policy and health care experts from Africa have indicated a number of areas that need to be strengthened, including the training of more scientists, the creation of solid institutions that ensure that scientists have specific, well-resourced projects to work on, training programs, and collaborative research links across Africa and abroad that are rooted in African health problems. As described in the section '*Disease Targets Selected by the Panama ICBG: Technology Transfer and Development for Bioassays*' the participation in biodiscovery research provided the framework and financial means by which technology was transferred to Panama or developed by local scientists, most of which was directed towards diseases of great importance to the host country. The presence of that technology in Panama has played a major role in catalyzing research, investments, and the training of students. While Africa provides a unique, variable, and challenging set of circumstances, the experience in Panama suggests that biodiscovery research could play a role in the strengthening of science and technology on the continent.[10]

Biodiscovery research at a crossroads

There is a tremendous need to develop novel treatments for diseases of global importance and no shortage of disease threats on the horizon (Garrett 2005), all of which would benefit from novel treatments. Diseases and pathogens are capable of rapidly developing resistance to existing drugs (Garrett 1995, Normile 2005). As discussed above, the pharmaceutical industry is showing a renewed interest in natural products (Koehn and Carter 2005) and new partnerships have emerged for the treatment of neglected diseases that are providing substantial funding for research (Nature 2005b). Collectively, these trends suggest that there will be a consistent demand for biologically active natural products. In addition, barring any remarkable change in circumstances or practices in developing counties, the destruction of tropical habitats described above is likely to continue, suggesting that those countries that maintain intact tropical habitats will become even more valuable from the perspective of biodiscovery research.

Does the current international political climate suggest that biodiversity rich countries are willing to leverage their biological wealth for participation in biodiscovery research, even under optimal circumstances? Unfortunately, that does not appear to be the case. A recent study of the Pacific Rim countries concludes '...in the next ten years countries and bioprospectors will probably continue to experience many of the policy development and implementation obstacles, limitations, and problems described in this report' (Carrizosa 2004a). Since the CBD was opened for signature, there are many examples from which developing countries can draw upon should they choose to enter into equitable biodiscovery research programs. But policy makers must appreciate that biodiscovery is a research-driven endeavor that can only succeed in the presence of flexible and clear ABS regulations. The benefits that host countries can receive from substantive participation in biodiscovery research are significant, but far more significant would be the discovery of treatments for diseases that are responsible for enormous human suffering in the developing world, trapping countries in a vicious cycle of poverty and ill health (Sachs 2002).

10 Among the examples of successful research institutions in Africa are the Kenya Medical Research Institute and the Malaria Research Training Centre in Bamako, Mali (Butler 2004). The latter was cited as a successful grass-roots initiative directed towards research into malaria, which has been successful in training scientists and generating high-quality research.

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