

An International Review of the Ex Situ Plant Collections of the Botanic Gardens of the World: - reviewing the plant genetic resource collections of botanic gardens worldwide, as a contribution to decision V/26 on Access to Genetic Resources of the Conference of the Parties to the Convention on Biological Diversity:

PART I: OVERVIEW AND ANALYSIS

Summary

This report presents a new overview and review of the botanic gardens of the world and their ex situ plant collections. It estimated that there are 2,178 botanic gardens known in the world, in 153 countries. It documents a total of 42 million herbarium specimens in botanic garden herbaria and 6.13 million accessions in their living collections. An analysis of the distribution of botanic gardens by region is presented, indicating that the majority of botanic gardens are in developed countries in Europe and North America. However, very significant numbers of botanic gardens also are found in most developing and tropical countries. The review suggests that more than 50% of the botanic gardens have been established since 1950 and that in excess of 100 new botanic gardens have been created since 1990. Part I of the report provides an overview and analysis of botanic gardens worldwide and by region. Part II includes details of the ex situ collections in each individual botanic garden, sorted and presented by country.

It is estimated that 90% of all living plant collections in botanic gardens pre-date the Convention on Biological Diversity and are therefore technically not covered by its provisions. Nevertheless botanic gardens have traditionally provided open access to their collections for bona fide scientific research, and to support conservation and public education. Since the Convention on Biological Diversity came into force, botanic gardens have developed new institutional, national and international policies and guidelines and harmonised practices. These aim to help ensure that their activities are carried out fully in accordance with the provisions of the Convention, and to ensure that they provide appropriate access and share any benefits derived from the use of their collections ethically and equitably with relevant stakeholders. Despite the fact that the majority of botanic garden collections pre-date the Convention, in general and as far as feasible, botanic gardens are working to ensure that their entire collections will be available to support all aspects of the implementation of the Convention.

1.0 Introduction

At the Vth Conference of the Parties to the Convention on Biological Diversity held in Nairobi, Kenya, from 15-26 May, 2000 issues relating to Access to Genetic Resources were considered extensively and the COP recognised the need for information on the status of genetic resources held ex situ. A Decision was made to continue an information-gathering exercise on ex situ collections acquired prior to the entry into force of the Convention and not addressed by the Commission on Genetic Resources for Food and Agriculture of the Food and Agriculture Organisation of the United Nations.

The Decision requested the Executive Secretary of the CBD to gather available information relating to genetic resource collections, by means of a questionnaire. Such a questionnaire was subsequently circulated by the Executive Secretary to Parties to the CBD and to other relevant bodies that may be able to provide information on ex situ genetic resource collections. The questionnaire seeks information on plant genetic resources held in seed gene banks, field and other collections. The questionnaire also aims to gather information on the number, origins and status of plant collections held in each country and whether these collections are held in public or private collections.

Botanic gardens are widely recognised as major repositories of plant material both in their living collections, seed and tissue banks and as preserved plant specimens in their herbaria.

The botanic garden community operates as a closely co-operating network worldwide, working to implement an *International Agenda for Botanic Gardens in Conservation*, an agreed global policy for botanic gardens prepared by Botanic Gardens Conservation International and published in June 2000 at the World Botanic Gardens Congress (Asheville, North Carolina U.S.A.) in June, 2000 (Wyse Jackson and Sutherland, 2000). BGCI itself is a membership organisation, coordinating and assisting conservation activities and efforts of botanic gardens throughout the world. BGCI's membership includes botanic gardens in about 110 countries.

Prior to undertaking the review of botanic gardens and their ex situ collections presented here, according to BGCI's data and as far as was known, there were in the region of 1,800 botanic gardens known in the world, in 146 countries. Furthermore, up to 2001, BGCI's estimate was that botanic gardens hold in the region of 2.5 million living plant accessions in their growing collections, which represent as many as 80,000 plant species. However, in Part I of this report new estimates of these figures are presented.

The native flora of many regions of the world is very widely cultivated by botanic gardens, which have often specialised in the maintenance of collections of wild species. During the 1980s and 1990s BGCI undertook extensive surveys of the plants in cultivation in botanic gardens for particular regions and plant families (aimed particularly at identifying rare and endangered plants in cultivation). The results of such surveys have show that a very significant proportion of the world's wild flora is cultivated in botanic gardens, much of which predates the CBD.

Table 1.0 provides information on the extent to which threatened plants from various selected regions and taxonomic groups that are known to be cultivated by botanic gardens (*data derived from BGCI's databases, 2000*).

TABLE 1.0 Rare and Endangered Plant Species from Selected Areas and Plant Families in Cultivation in Botanic Gardens Worldwide

<i>Region</i>	<i>Total no. of species surveyed</i>	<i>Total no. of species located in cultivation in botanic gardens</i>
Australia	1,867	893
China	338	211
Cuba	874	55
Europe	1,723	558
India	927	105
Macaronesia	557	419
Mascarene Is.	377	160
New Zealand	1,951	514
South Africa	1,051	514
U.S.A.	3,324	890

<i>Families</i>	<i>Species surveyed</i>	<i>Cultivated</i>
Cacti	451	385
Conifers	264	179
Cycads	105	81
Ferns	600	73
Orchids	986	306
Palms	665	298

Some of these data were first received by BGCI in the 1990s, and even earlier, and it is likely that higher percentages of threatened plants from some groups and regions are today represented in cultivation. This information was based upon responses to questionnaires from approximately 350 botanic gardens.

BGCI has estimated that between 90% and 95% of all current botanic garden holdings of living plant material were obtained prior to the Convention on Biological Diversity. However, no comprehensive analysis of such collections had ever before been attempted.

With the current focus of the Convention on Biological Diversity on the issue of access to genetic resources, it is essential that a clear and comprehensive overview of the situation with regard to botanic garden collections be urgently obtained. Although BGCI has gathered detailed information on the resources and collections of botanic gardens worldwide for over a decade, the organisation has not had the resources available to it to attempt to prepare such a review.

Although a few individual countries (e.g. Germany) have prepared valuable analyses on the extent and nature of genetic resource collection in botanic gardens, these have not been much more widely attempted. No international or national bodies other than BGCI currently hold comprehensive data on the botanic gardens of the world.

Botanic gardens have traditionally provided access to their collections, particularly for scientific and conservation purposes (often via an international seed exchange programme). However, only in recent years have they begun to implement policies and procedures that address new obligations in relation to providing appropriate access to their collections and sharing benefits derived from the use of such collections, as required by the CBD and related national legislation.

Nevertheless, to date, no survey has been undertaken of the extent to which botanic gardens have implemented new access and benefit-sharing regimes.

2.0 Activities undertaken as part of the project

As part of the project, BGCI has gathered, sorted and analysed existing and new data on the collections in botanic gardens throughout the world.

As a result of the analysis undertaken by BGCI the following data is presented.

1. The number of botanic gardens in each country of the world. We have included information both on botanic gardens in all CBD Parties, as well as in countries that are non-Parties.
2. The names, location (addresses) and status of each botanic garden in the world.
3. An estimate of the total number of accessions in cultivation in each botanic garden (where possible), together with an analysis of the total numbers of accessions in cultivation in botanic gardens in each country (again, where possible).
4. Information on the nature of plant collections in botanic gardens, e.g. taxonomic and geographical strengths and interests (e.g. medicinal plant collections).
5. Details on whether the botanic gardens maintain conservation collections of threatened plants or of other groups.
6. An estimate of the percentage and numbers of accessions that pre- and post-date the Convention in each country (where possible).
7. An estimate of the total number of species (and taxa) in cultivation in the world has also been made.
8. Information on the extent of herbarium collections in botanic gardens has also been presented.
9. Information of any existing or proposed arrangements made by botanic gardens with regard to access and benefit-sharing (including whether they have adopted or implemented specific policies or agreed national/international protocols in relation to access and benefit-sharing and whether they provide access to their collections via the international seed exchange scheme).

Where possible, we have also outlined some details of other non-botanic garden institutions maintaining significant ex situ collections. In general these are public gardens, in such countries as Canada, France, Italy and the United Kingdom, where there is a long tradition or private landowners assembling extensive and diverse collections of exotic plants for various purposes. While many of these cannot currently be regarded as scientific collections (especially as their documentation is often inadequate), many have taken on new significance in recent years and have considerable potential to become important genetic resources in the future.

Data presented in Part II of this report were assembled and analysed from the following sources:

- BGCI's existing databases on the botanic gardens of the world;
- Information sought as appropriate and available from individual botanic gardens and network organisations;
- BGCI's library resources of brochures, reports, correspondence, presentations from individual botanic gardens and a wide variety of published sources;
- Botanic garden Internet web pages;

- Electronic datasets held by BGCI on the living plant collections of many botanic gardens;
- Personal knowledge of BGCI's staff who have personally visited and worked with several hundred of the institutions included.

3.0 Criteria applied for inclusion of botanic gardens in the list

There are no formal criteria or general agreement as to what constitute a botanic garden. Therefore any list of botanic gardens is somewhat subjective and can neither be fully comprehensive nor regarded as definitive.

The most recent definition of a botanic garden is than provided in the *International Agenda for Botanic Gardens in Conservation* (Wyse Jackson, P. and Sutherland, L. 2000). The relevant extract is provided below.

3.1. The characteristics (and definition) of a botanic garden

The lack of a very clear definition as to what constitutes a 'botanic garden' has blurred the edges between what are public parks or private collections and what are true scientifically-based botanic gardens. Some institutions have been accepted into the list even though they might only be marginally described as a botanic garden.

An early definition of a botanic garden given by the International Association of Botanic Gardens (IABG) was '...a botanic garden or arboretum is one open to the public and in which the plants are labelled'. However *The Botanic Gardens Conservation Strategy* (IUCN-BGCS and WWF 1989) contains a more comprehensive list of characteristics defining a botanic garden that incorporate the diversity of roles that these institutions now undertake.

3.2. Defining characteristics of a botanic garden

- adequate labelling of the plants
- an underlying scientific basis for the collections
- communication of information to other gardens, institutions, organisations and the public
- exchange of seeds or other materials with other botanic gardens, arboreta or research stations (within the guidelines of international conventions and national laws and customs regulations)
- long term commitment to, and responsibility for, the maintenance of plant collections
- maintenance of research programmes in plant taxonomy in associated herbaria
- monitoring of the plants in the collection
- open to the public
- promoting conservation through extension and environmental education activities
- proper documentation of the collections, including wild origin
- undertaking scientific or technical research on plants in the collections

This list does not, however, constitute a comprehensive summary of the activities undertaken by botanic gardens.

(Adapted from IUCN-BGCS and WWF 1989, p5)

It should be recognised that there are many institutions that are clearly botanic gardens but are only able to meet some of these criteria. BGCI's most recent definition of a botanic garden is one that it hopes encompasses the spirit of a true botanic garden:

‘Botanic gardens are institutions holding documented collections of living plants for the purposes of scientific research, conservation, display and education’

(Wyse Jackson 1999, p27)

In some instances a garden has retained the name ‘botanic’ for historic reasons. Some or even most of the plant collection may survive but all scientific activities have ceased and documentation has been lost. One might argue for the removal of these from the global list of botanic gardens. However, experience has shown that it is precisely these institutions in many parts of the world that are currently being revived, redeveloped and re-established to become potentially important botanical centres.

Within the context of the International Agenda for Botanic Gardens in Conservation, the use of the term ‘botanic gardens’ should be interpreted to include arboreta and other specialised forms of plant collection.

Despite the difficulties in deciding what institutions should be included in a list of botanic gardens worldwide, we believe that the report presented here includes the majority of botanic gardens, arboreta and similar institutions worldwide holding significant ex situ collections of living plants.

4.0 Overview of botanic gardens and their distribution.

According to the present study there are currently 2,178 botanic gardens known in the world (see Table 4.1 and Figures 4.1 and 4.2). Over 500 botanic gardens occur in Western Europe, more than 350 in North America and over 200 in East and Southeast Asia, of which the majority are in China. Most of the southern Asian botanic gardens are to be found in India. Most regions of the world have a range of botanic gardens although there are relatively few in North and Southern Africa, the Caribbean islands, South West Asia and the Middle East.

Figure 4.1: Worldwide distribution of botanic gardens

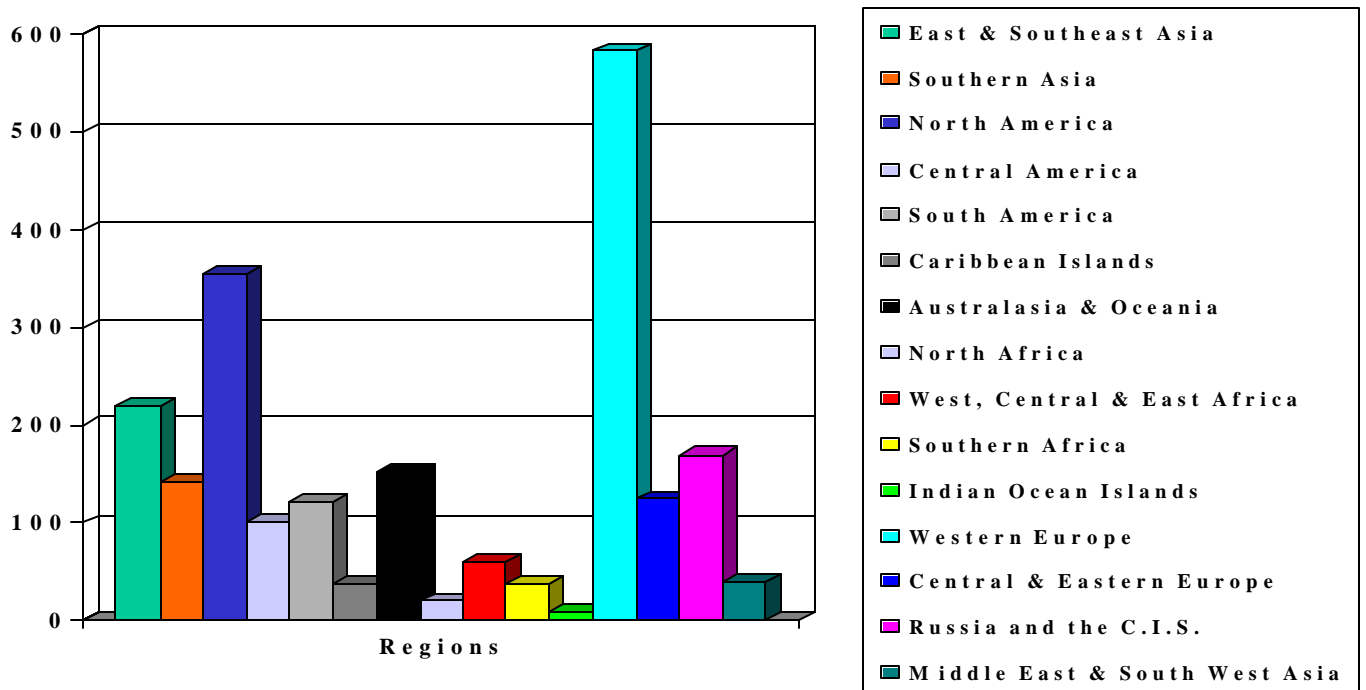
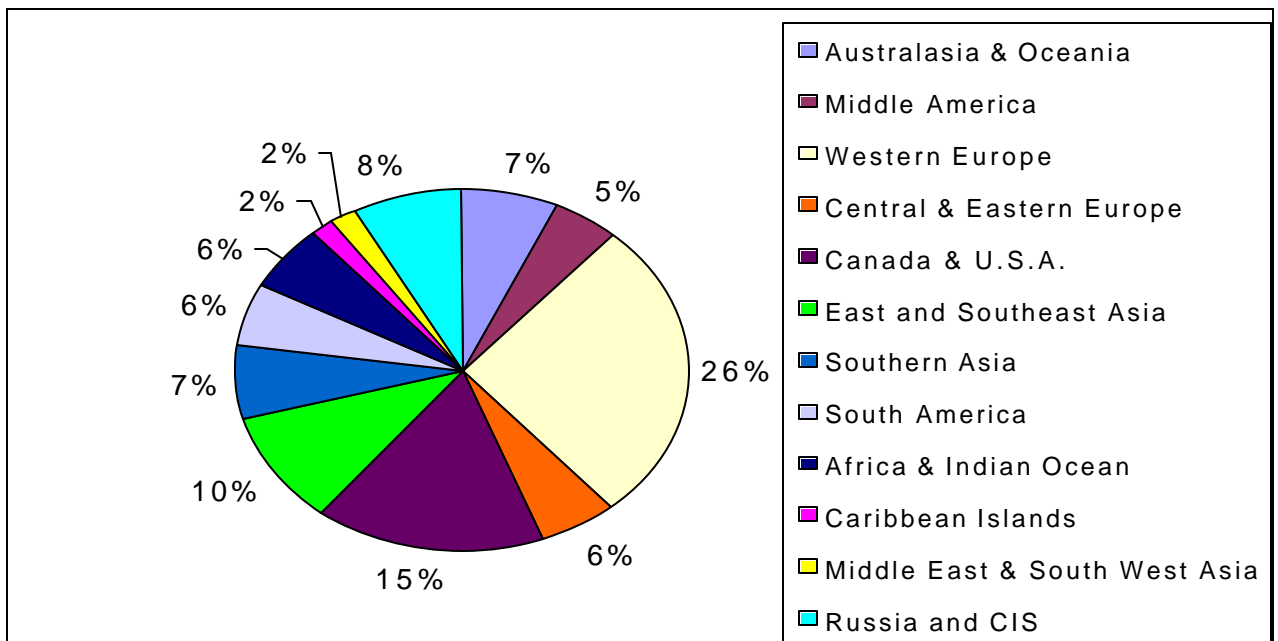


Figure 4.2: Percentage distribution of the world's botanic gardens by region.



4.1 Regional distribution of Botanic Gardens

The following pages present a graphical view of the distribution of botanic gardens in each different region of the world (Figures 4.1.1 - 4.1.13). The number of botanic gardens in each country are given in Table 4.1. Those countries without any known botanic gardens are listed in Table 4.2.

Figure 4.1.1. Graphical distribution of botanic gardens in each region of the world: Western Europe: The greatest number of botanic gardens in Western Europe occur in France, Germany, Italy and the U.K. Amongst the larger Western European countries only Greece has a relatively small number of botanic gardens and most of these are small or new institutions.

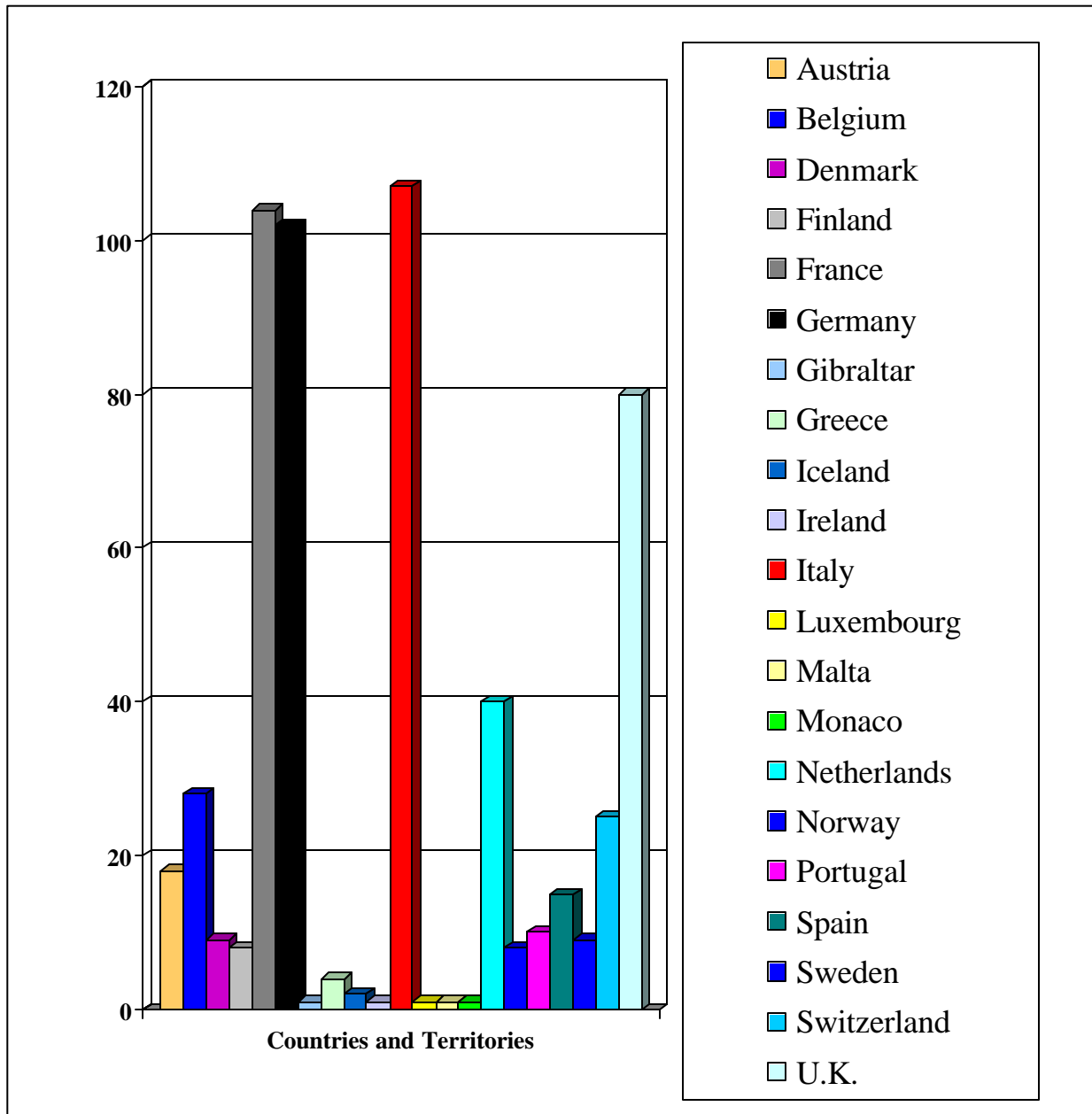


Figure 4.1.2. Graphical distribution of botanic gardens in each region of the world: Eastern and Central Europe: The largest number of botanic gardens in Eastern and Central Europe are to be found in the Czech Republic and Poland. However, significant numbers occur in most countries in the region.

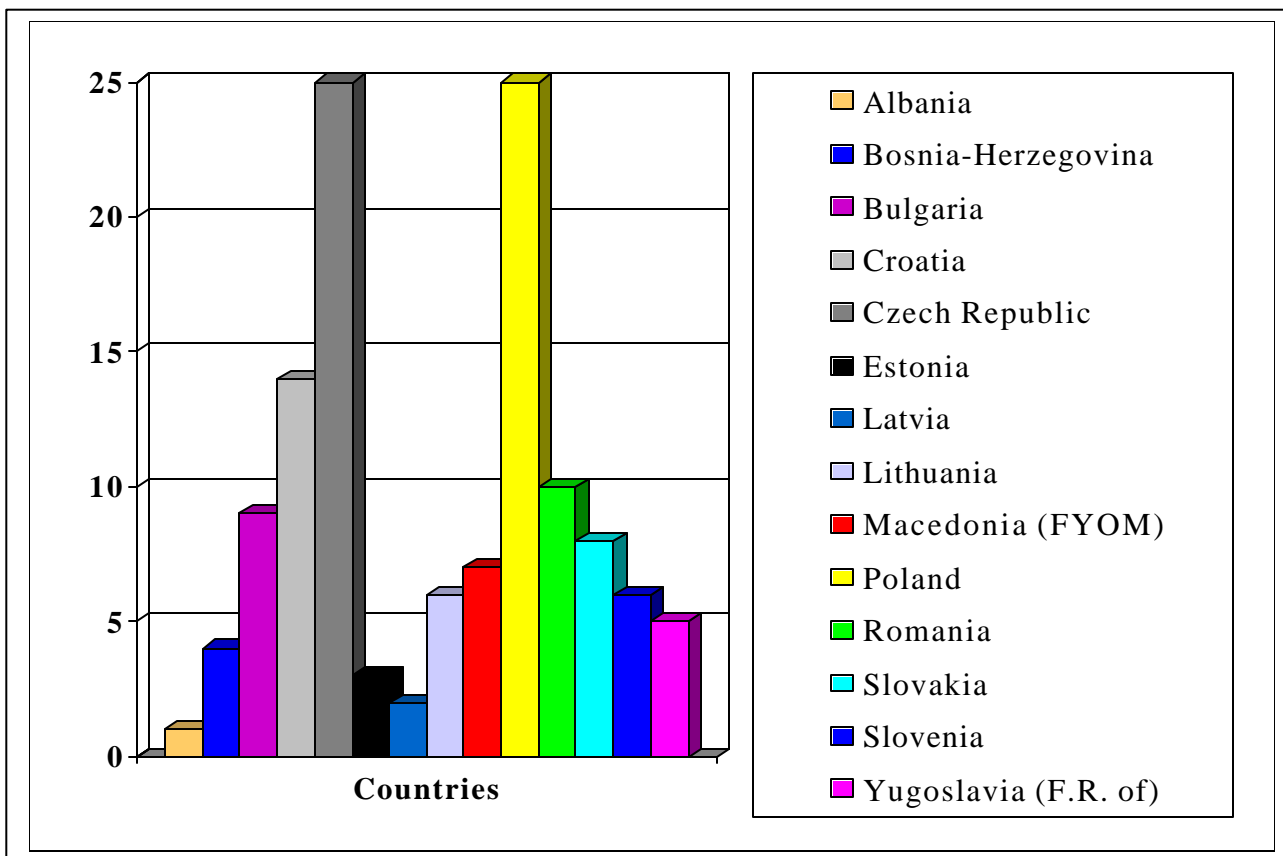


Figure 4.1.3. Graphical distribution of botanic gardens in each region of the world: Australasia and Oceania: The majority of botanic gardens are in Australia and New Zealand. There are relatively few in the Pacific Ocean Islands (other than in Hawaii - included under the U.S.A.). There are no botanic gardens known in the following countries: the Cook Islands, French Polonesia, Guam, Kiribati, Marshall Islands, Micronesia, Nauru, New Caledonia, Palau, Pitcairn Islands. Sainan and Tinian. Tonga. U.S. Pacific Trust Territories. Tuvalu and Vanuatu.

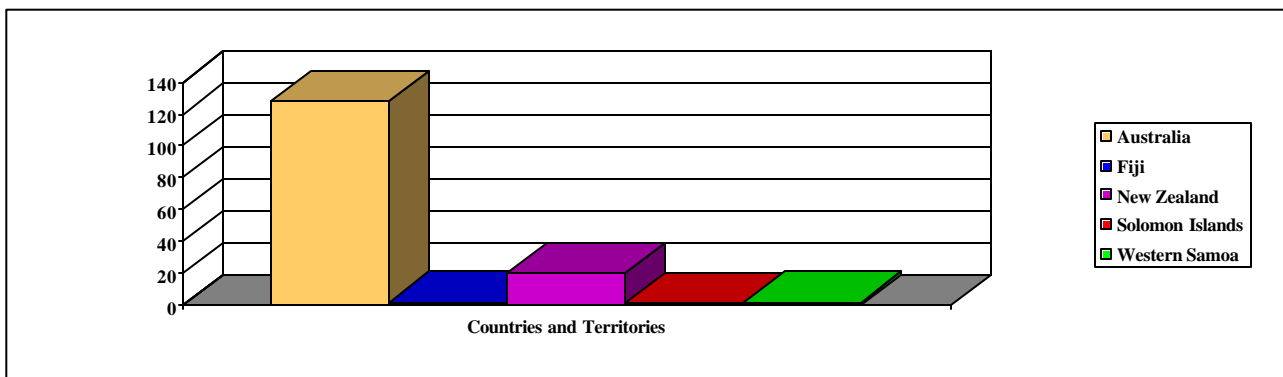


Figure 4.1.4. Graphical distribution of botanic gardens in each region of the world: South West Asia and the Middle East: There are small numbers of botanic gardens in the majority of countries of South West Asia and the Middle East, although there are no botanic gardens in Afghanistan, Bahrain, Jordan, Lebanon, Qatar, Syria, Yemen.

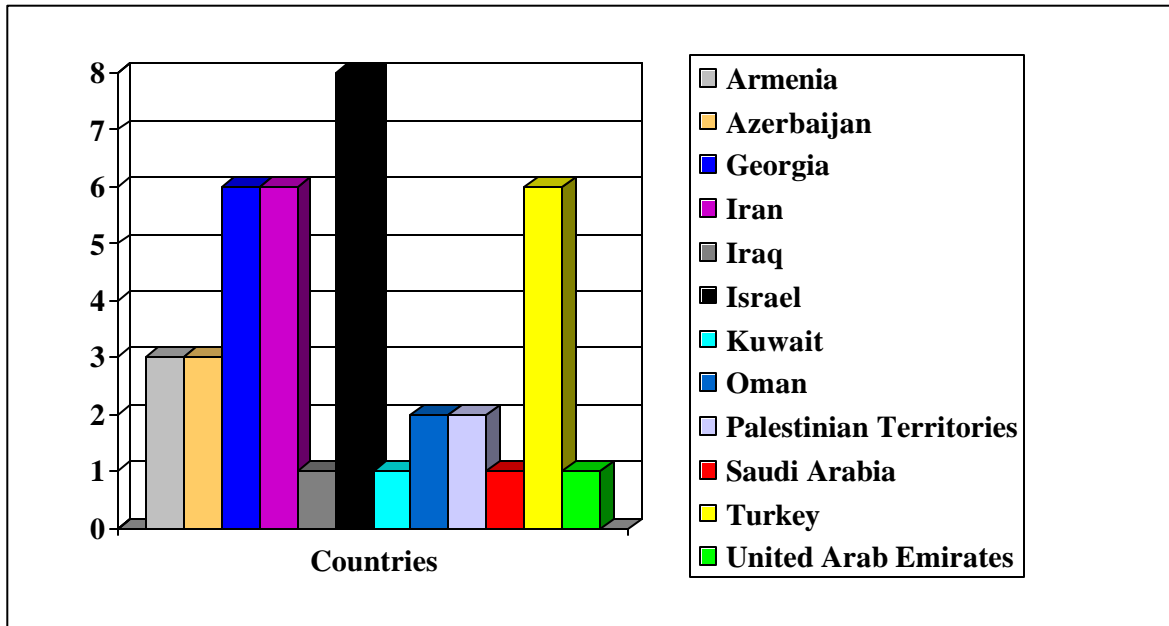


Figure 4.1.5. Graphical distribution of botanic gardens in each region of the world: North Africa: North Africa has a small number of botanic gardens scattered throughout the region, other than in the following countries where none are known: Central African Republic, Chad, Djibouti, Eritrea, Mali, Mauritania, Niger and Somalia. Botanic gardens in Morocco and Tunisia have recently been redeveloped and expanded.

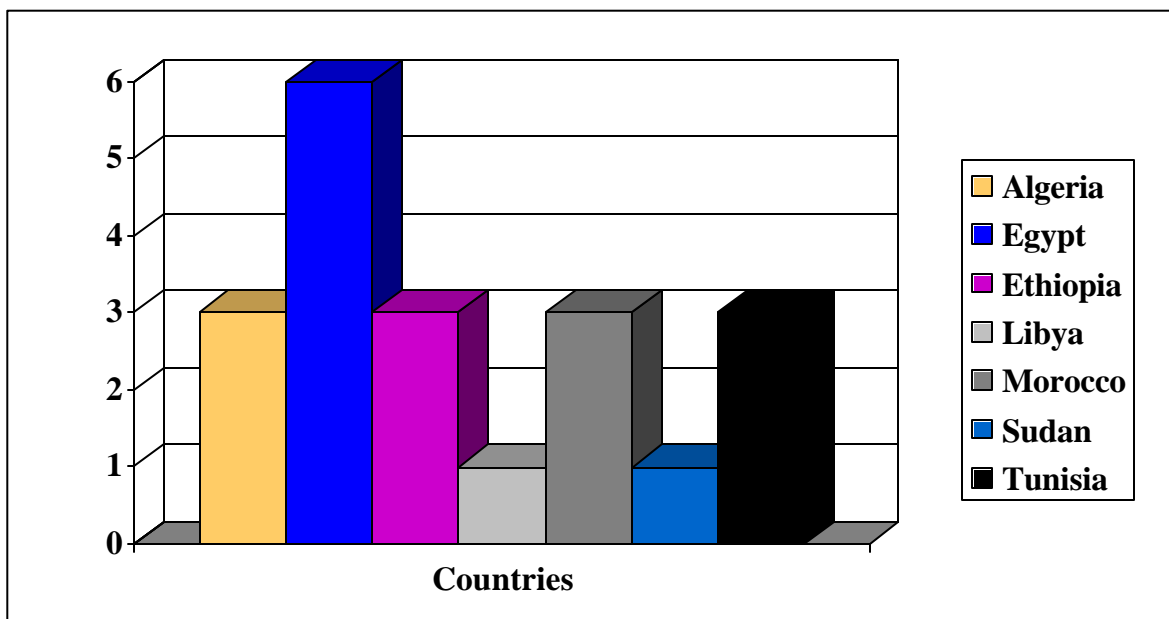


Figure 4.1.6. Graphical distribution of botanic gardens in each region of the world: West, Central and East Africa: Nigeria has the most botanic gardens in this region (16), followed by Kenya (which has 9) although there are one or more in most major countries. No botanic gardens are known in the following countries: Burkina Faso, Guinea, Guinea-Bissau, Equatorial Guinea, Congo, Sao Tome and Principe.

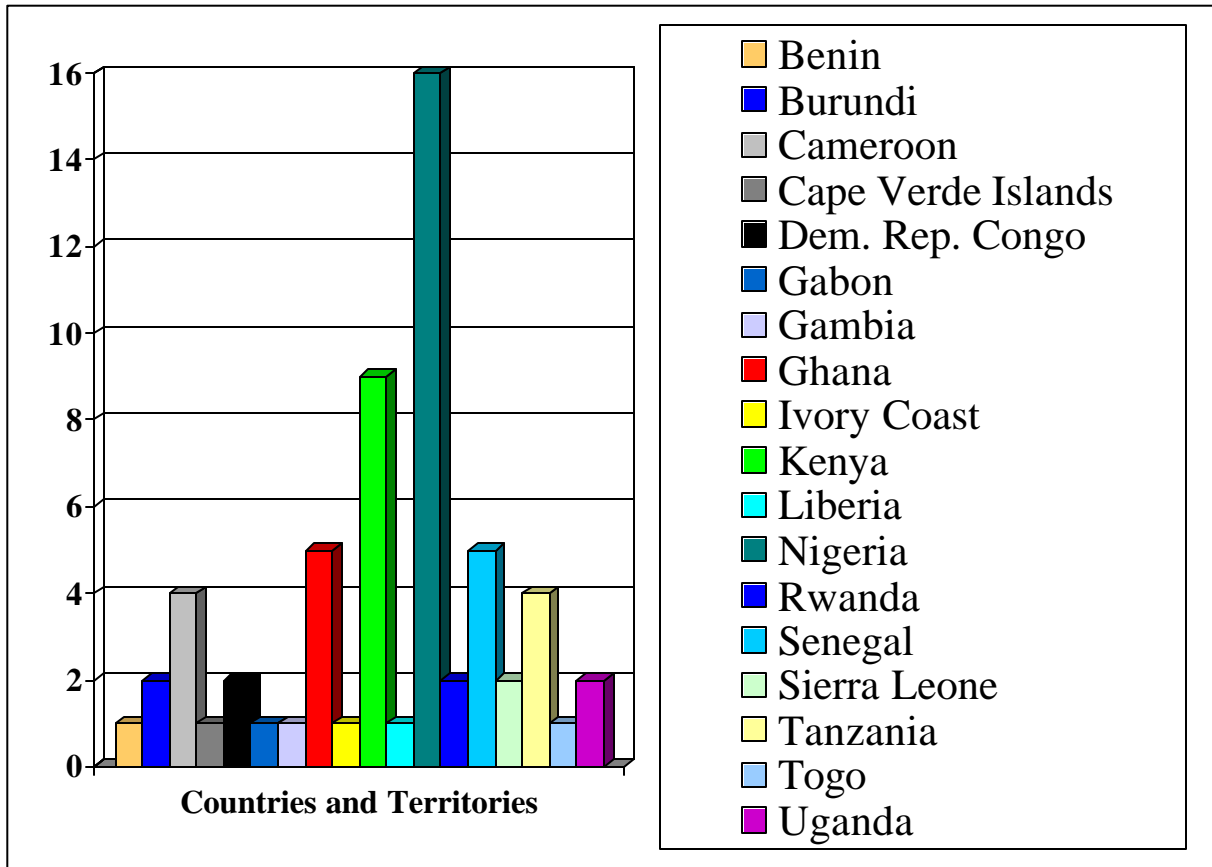


Figure 4.1.7. Graphical distribution of botanic gardens in each region of the world: Indian Ocean Islands: Botanic gardens occur in four of the Indian Ocean Island territories and countries: the Seychelles, Mauritius (where the oldest tropical botanic garden in the world still thrives), Réunion and Madagascar. No botanic gardens are known in the British Indian Ocean Territory, the Maldives, Comoros, Mayotte or Rodrigues.

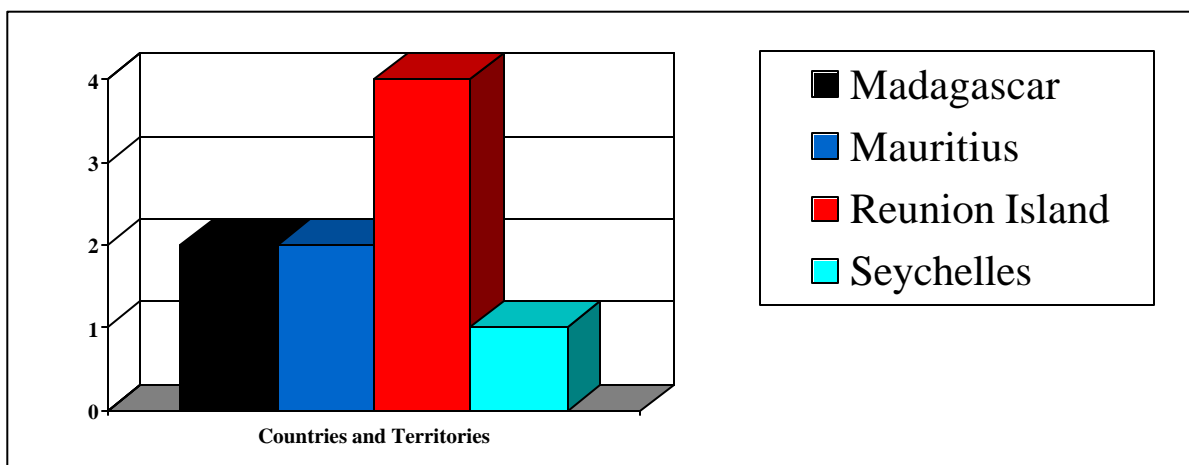


Figure 4.1.8. Graphical distribution of botanic gardens in each region of the world: Southern Africa and the Southern Atlantic Islands: The largest number of botanic gardens in this region are in South Africa. In recent years new botanic gardens have been established or expanded in several countries. No botanic gardens in Ascension Island, South Georgia, the South Sandwich Islands or Tristan da Cunha.

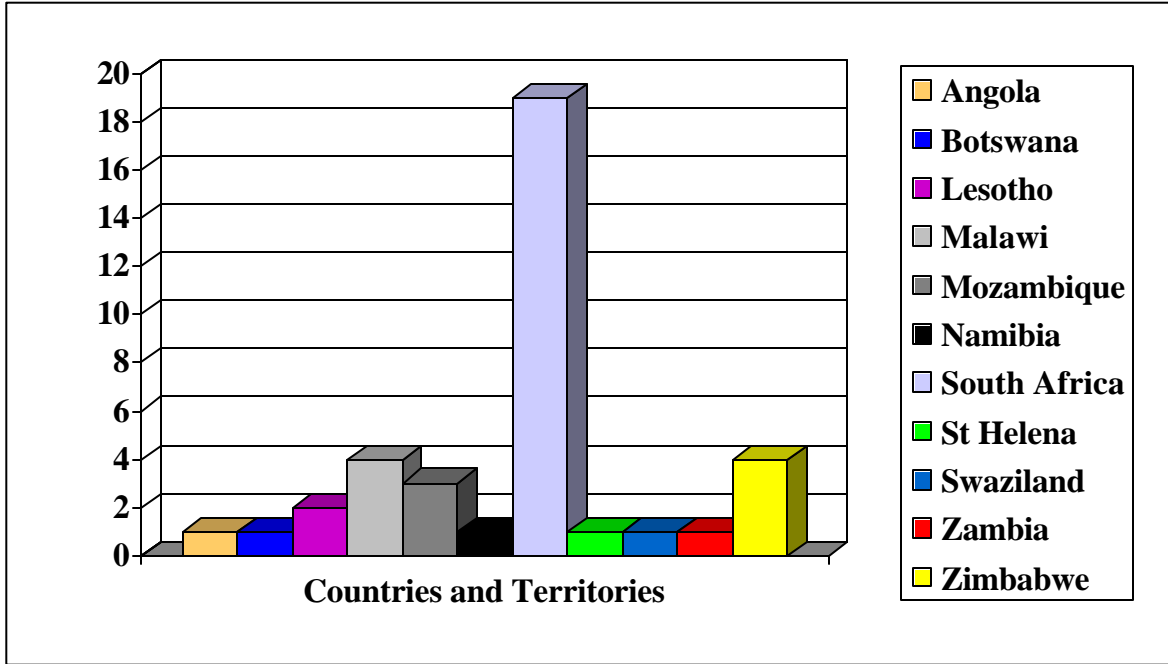


Figure 4.1.9: Graphical distribution of botanic gardens in each region of the world: Southern Asia: There are botanic gardens in every country in Southern Asia, although the vast majority are in India. In recent years the first botanic garden has been established in Bhutan.

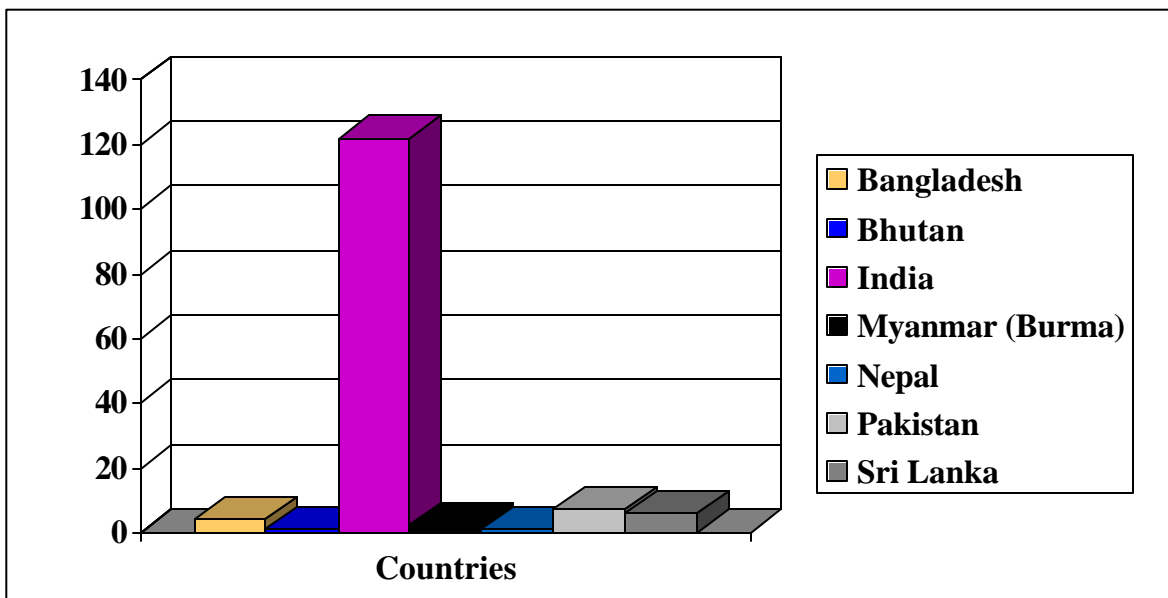


Figure 4.1.10. Graphical distribution of botanic gardens in each region of the world: East and Southeast Asia: The majority of botanic gardens in these regions occur in China where there are more than 100 and Japan where there are more than 50. There are no botanic gardens known in Brunei Darussalam, Cambodia and the Lao People's Democratic Republic.

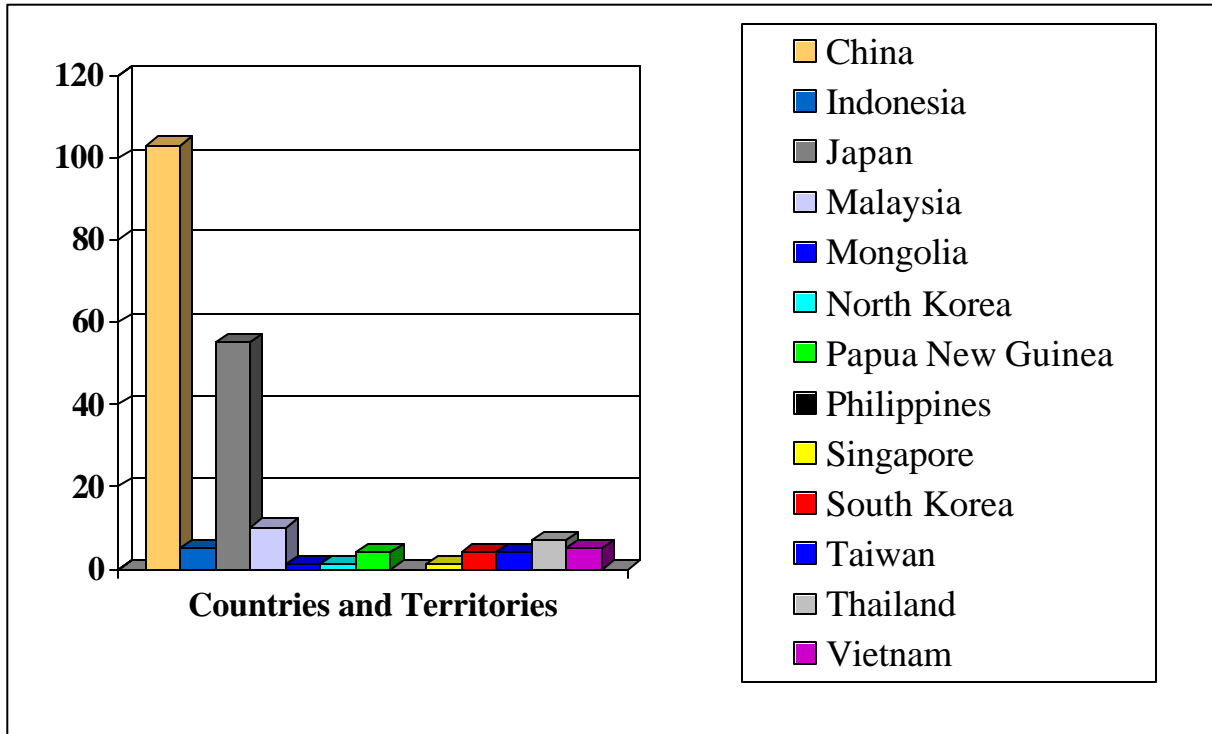


Figure 4.1.11 Graphical distribution of botanic gardens in each region of the world: Central and North America: The majority of botanic gardens in these regions occur in the United States, Mexico and Canada. All Central American countries have at least one botanic garden.

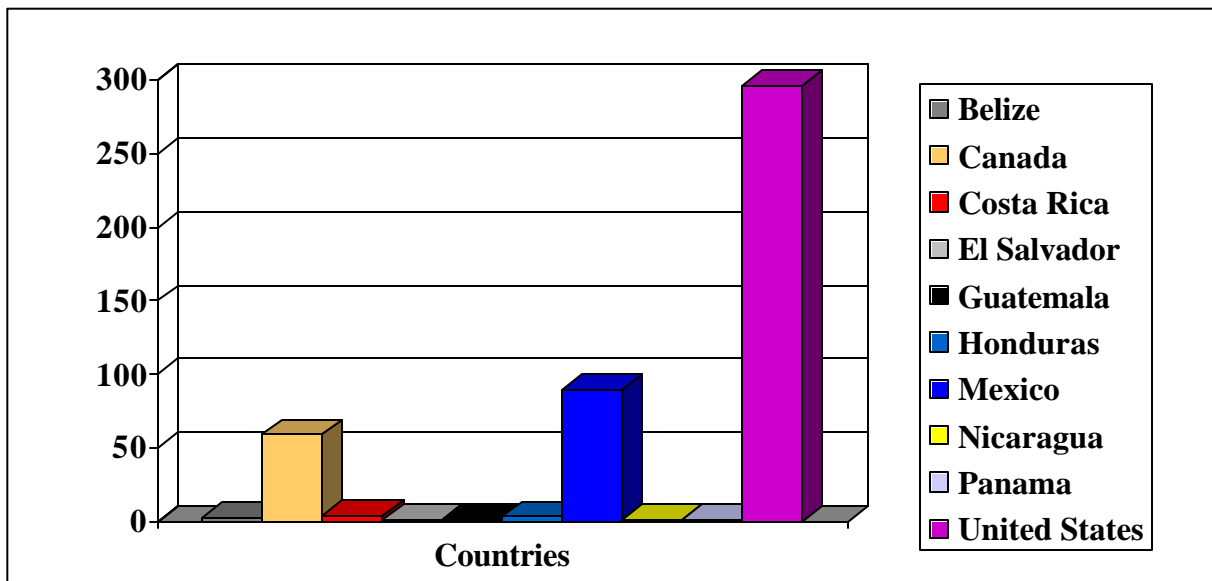


Figure 4.1.12. Graphical distribution of botanic gardens in each region of the world: The Caribbean islands: The largest number of botanic gardens occur in Cuba. Many of these are newly developed institutions focussed on biodiversity conservation and education. Most of the major island countries have at least one botanic garden, which are generally either old historic colonial gardens or else relatively recent establishments. There are no botanic gardens known in the following countries: Haiti, St Lucia and the Turks & Caicos.

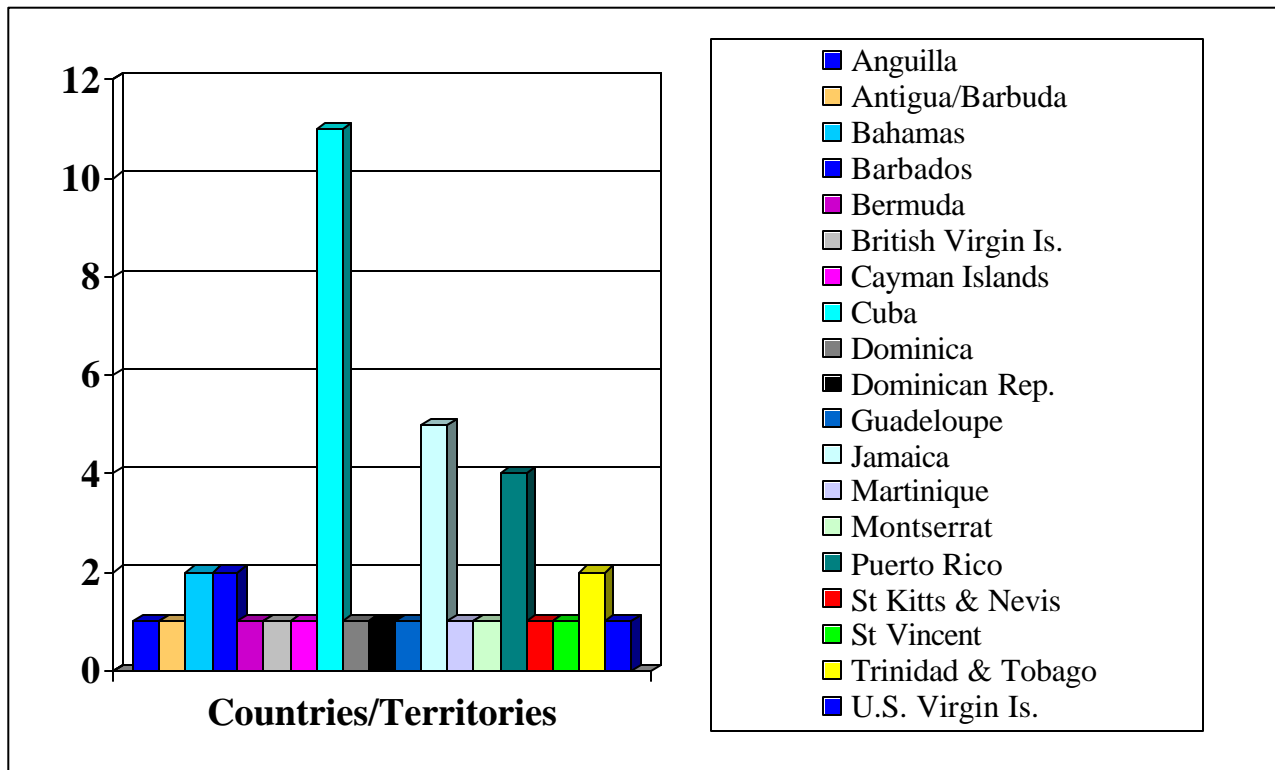


Figure 4.1.13. Graphical distribution of botanic gardens in each region of the world: South America: The majority of botanic gardens in this region are in Argentina, Brazil and Colombia. Many of these have been recently established, particularly in Brazil and Colombia.

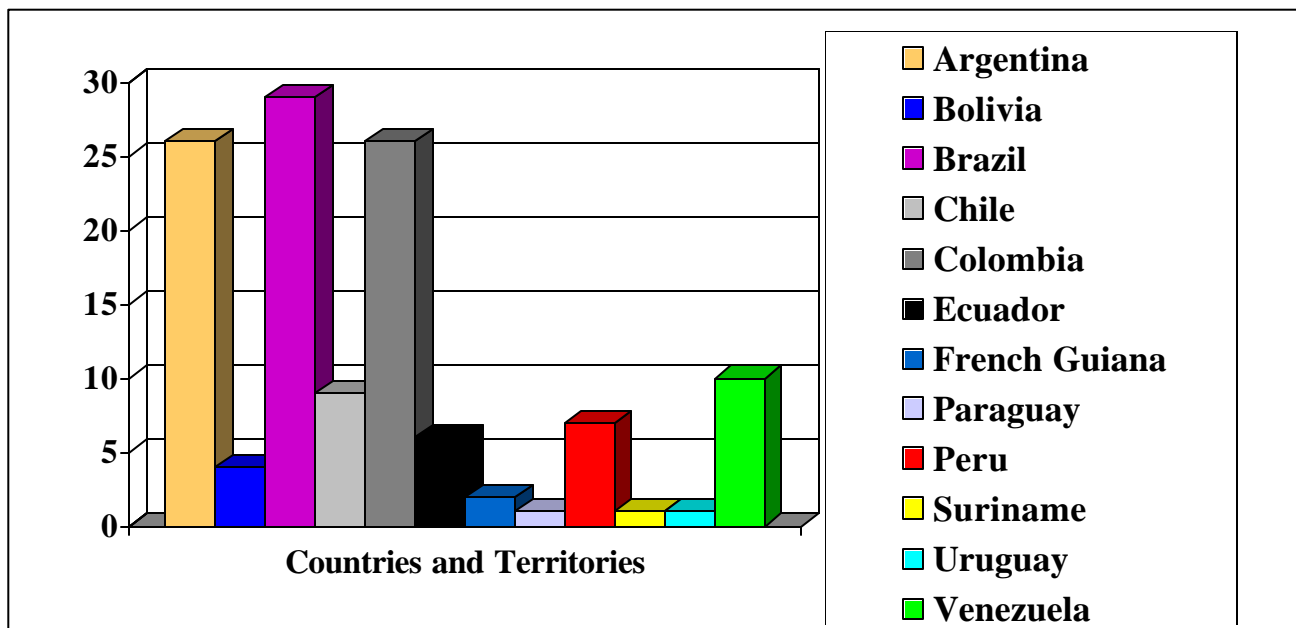


TABLE 4.1: World distribution of botanic gardens

Region	No. of botanic gardens recorded
AFRICA	
North Africa	20
West, Central & East Africa	60
Southern Africa	38
Indian Ocean Islands	<u>9</u>
	127
AMERICAS	
North America	355
Central America	102
South America	122
Caribbean Islands	<u>38</u>
	617
ASIA	
East & Southeast Asia	220
Southern Asia	143
Middle East & South West Asia	<u>40</u>
	403
AUSTRALASIA/OCEANIA	
Australasia & Oceania	<u>153</u>
	153
EUROPE	
Western Europe	583
Central & Eastern Europe	125
Russia and the C.I.S.	<u>170</u>
	878
TOTAL	2,178

No. of countries with one or more botanic gardens: 153

4.2 Countries and territories without a botanic garden

The following table lists countries and territories where there are currently no botanic gardens (or none known). Most large countries have one or more botanic gardens. There are still relatively few countries in the Middle East and Pacific Ocean regions with botanic gardens. There are also very few botanic gardens in the countries of the Sahel in northern Africa.

TABLE 4.2: Countries and territories without a botanic garden

<i>Europe</i>	
<ul style="list-style-type: none">• Andorra• Cyprus• Liechtenstein	<ul style="list-style-type: none">• San Marino• The Vatican
<i>South West Asia and the Middle East</i>	
<ul style="list-style-type: none">• Afghanistan• Bahrain• Jordan• Lebanon	<ul style="list-style-type: none">• Qatar• Syria• Yemen
<i>East, South and South-East Asia</i>	
<ul style="list-style-type: none">• Brunei• Cambodia	<ul style="list-style-type: none">• Laos
<i>Australasia and Oceania</i>	
<ul style="list-style-type: none">• Cook Islands• French Polynesia• Guam• Kiribati• Marshall Islands• Micronesia• Nauru• New Caledonia	<ul style="list-style-type: none">• Palau• Pitcairn Islands, Henderson and Ducie• Saipan and Tinian• Tonga• Tuvalu• U.S. Pacific Trust Territories• Vanuatu
<i>Africa, the Indian Ocean Islands and the South Atlantic Islands</i>	
<ul style="list-style-type: none">• Ascension Island• British Indian Ocean Territory• Burkina Faso• Central African Republic• Chad• Comoros• Congo• Djibouti• Equatorial Guinea• Eritrea• Guinea	<ul style="list-style-type: none">• Guinea-Bissau• Maldives• Mali• Mauritania• Mayotte• Niger• Sao Tome and Principe• Somalia• South Georgia• South Sandwich Islands• Tristan da Cunha
<i>Central America, South America and the Caribbean</i>	
<ul style="list-style-type: none">• Falkland Islands• Haiti	<ul style="list-style-type: none">• St Lucia• Turks and Caicos

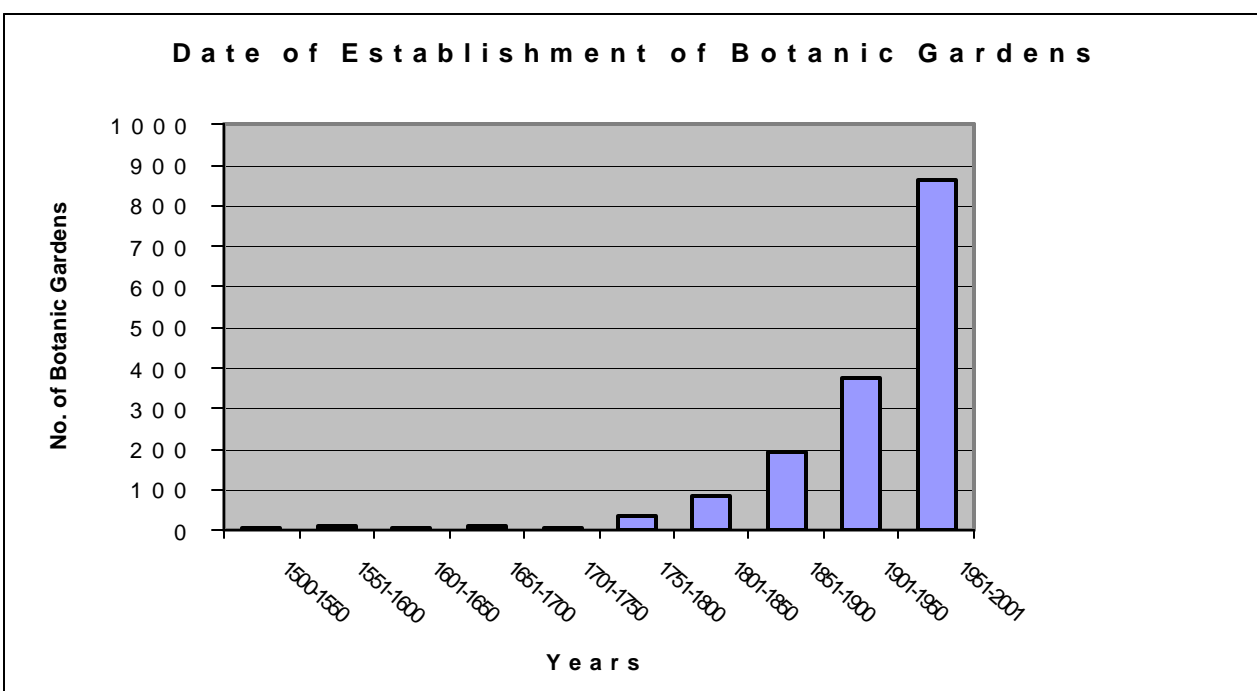
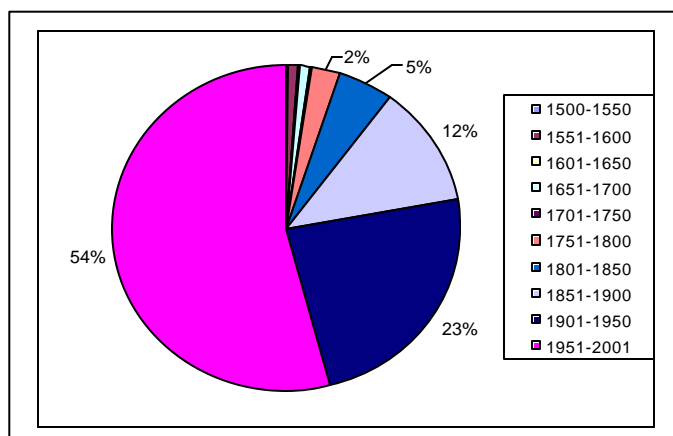
5.0 Trends in the establishment of botanic gardens

Of a total of 1,594 botanic gardens, for which the date of their foundation is known, 54% (865) were established during the 50 years between 1951 and 2001. The current trend for the creation of new botanic gardens in many parts of the world shows no signs of diminishing and indeed since 1990 over 100 botanic gardens listed in the report have been created.

During the last 50 years botanic gardens have been created in most regions, however, it is in the tropics that the greatest proportional percentage of new botanic gardens have been created. For example, in Brazil, of a total of 29 botanic gardens known, only two botanic gardens are known to be older than 1900, whereas at least 14 have been established since 1990. Although there are still comparably lower numbers of botanic gardens in some regions of the world such as Latin America, the Middle East and China and South East Asia, in these regions, in the late 1990s many new botanic gardens and projects have been initiated, as well as existing older botanic gardens rehabilitated.

Table 5.1: Date of establishment of the world's botanic gardens

Date	Percentage	No.
1500-1550	<1%	6
1551-1600	<1%	10
1601-1650	<1%	8
1651-1700	<1%	10
1701-1750	<1%	8
1751-1800	2%	36
1801-1850	5%	84
1851-1900	12%	193
1901-1950	23%	374
1951-2001	<u>54%</u>	<u>865</u>
Total for which data are available		1,594



6.0 The types of botanic gardens

Within the definition of a botanic garden given above, there may be included a great diversity of institutions ranging from large gardens with several hundred staff and a diverse range of activities to small institutions with limited resources and activities.

The fastest growing sector in the botanic garden world is the creation of community botanic gardens. These gardens are designed to serve specific needs in their local communities and are often managed by those same communities. Many of these new community gardens have not been included in Part II of this report but it is hoped to document more information on such mini-botanic gardens in the future. In some tropical countries, a number of botanic gardens have been created alongside national parks and have been designed to play roles in integrated conservation, sustainable development and public education.

A diverse range of organisations and administrations manage botanic gardens. Many are state administered or managed by regional, municipal or local authorities and receive public funding. More than 30% of the world's botanic gardens belong to universities and other research institutes for higher education, and a relatively small proportion are private. In recent years the trend has been for botanic gardens to gain greater financial and administrative independence, often becoming trust-administered and operating partly with funds gained through their independent fund-raising efforts.

The types of botanic gardens worldwide have been classified recently (in Wyse Jackson and Sutherland, 2000). This classification is given below:

- 1 'Classic' multi-purpose gardens - are often institutions with a broad range of activities in horticulture and horticultural training; research, particularly in taxonomy with associated herbaria and laboratories; and public education and amenity. They are generally state supported.
2. Ornamental gardens - are often very beautiful establishments with diverse plant collections that are documented; they may or may not currently have research, education or conservation roles. Some ornamental gardens are privately owned and many municipal gardens fall into this category.
3. Historical gardens - include the earliest gardens developed for the teaching of medicine; some were established for religious purposes. A number of these gardens are still active in medicinal plant conservation and research, and today are primarily concerned with the collection and cultivation of medicinal plants and increasing public awareness about them.
4. Conservation gardens - most have recently been developed in response to local needs for plant conservation. Some contain, or have associated areas of, natural vegetation in addition to their cultivated collections. Included in this category are native plant gardens, which only cultivate plants from their surrounding region or national flora. Most conservation gardens play a role in public education.
5. University gardens – many universities maintain botanic gardens for teaching and research. Many are open to the public.
6. Combined botanical and zoological gardens – are currently reassessing the roles of their botanical collections. Plants collections are being researched and developed that provide habitats for the displayed fauna, and interpretation of these habitats to the general public is an important element.
7. Agro-botanical and germplasm gardens – function as an ex situ collection of plants of economic value or potential for conservation, research, plant breeding and agriculture. Several

are experimental stations associated with agricultural or forestry institutes and contain associated laboratory, plant breeding and seed testing facilities but many are not open to the public.

8. Alpine or mountain gardens – are most frequently in mountain regions of Europe and some tropical countries. They are specifically designed for the cultivation of mountain and alpine flora, or in the case of tropical countries, for the cultivation of subtropical or temperate flora. Some alpine and mountain gardens are satellite gardens of larger lowland botanic gardens.

9. Natural or wild gardens – contain an area of natural or semi-natural vegetation, which is protected and managed. Most are established to play conservation and public education roles and include areas where native plants are grown.

10. Horticultural gardens – are often owned and maintained by horticultural societies and open to the public. They exist primarily to foster the development of horticulture through the training of professional gardeners, plant breeding, registration and conservation of garden plant varieties.

11. Thematic gardens – these specialise in growing a limited range of related or morphologically similar plants or plants grown to illustrate a particular theme generally in support of education, science, conservation and public display. These include orchid, rose, *Rhododendron*, bamboo and succulent gardens or gardens established on such themes as ethnobotany, medicine, bonsai, topiary, butterfly gardens, carnivorous plants and aquatic s.

12. Community gardens – are generally small gardens with limited resources, developed for, and by, a local community to fulfil its particular needs, such as recreation, education, conservation, horticultural training, and the growth of medicinal and other economic plants.

7.0 Pre- versus post-CBD collections in botanic gardens

The vast majority of collections in the botanic gardens of the world were accessed by the botanic gardens holding them prior to the entry into force of the Convention on Biological Diversity. Estimates made during this study suggest that in up to 100 countries, between 80% and 100% of the botanic garden collections pre-date the CBD:

- 62 countries 90% of collections held by botanic gardens pre date the CBD
- 34 countries 80% - 90% of collections held by botanic gardens pre-date the CBD
- 16 countries 70% - 80% of collections held by botanic gardens pre-date the CBD
- 6 countries 60% - 70% of collections held by botanic gardens pre-date the CBD
- 6 countries 50% - 60% of collections held by botanic gardens pre-date the CBD
- 6 countries less than 50% of collections held by botanic gardens pre-date the CBD

In those countries where botanic gardens hold a small percentage of pre-CBD collections, the botanic gardens are newly established institutions created in most cases during the 1990s.

8.0 Access and benefit-sharing arrangements

Botanic gardens have traditionally promoted the free exchange of plant materials with other botanic gardens, particularly in the form of seeds and spores. For much of the 20th century several hundred botanic gardens have prepared Indices Seminum, or seed exchange lists, that were sent to other botanic gardens throughout the world. This easy exchange of plant materials considerably supported the development of major and diverse living plant collections in botanic gardens throughout the world. In general plant material was exchanged in this way for scientific, non-commercial uses. However, it is clear that plant material from many botanic garden collections have been used to support aspects of national development and the commercial use of plants in a wide range of countries throughout the world for the development of agriculture, commercial horticulture, forestry, pharmaceutical industries and other sectors.

With the enactment of the Convention on Biological Diversity, the botanic garden community has become aware that a radical re-assessment of the international seed exchange scheme is required to ensure that it meets the requirements of the Convention. Although botanic gardens have provided excellent access to their collections and have traditionally shared benefits with stakeholders in many parts of the world (generally in the form of scientific collaboration, training and technical support), botanic gardens realise that much more efficient tracking of information on their collections will be required in future to ensure that benefits are shared equitably and to meet the special requirements or conditions under which the plant material was originally supplied from the country of origin.

For those reasons, an increasing number of botanic gardens now distribute plant material to other institutions subject to individual material transfer or acquisition agreements. Typically, such agreements allow those receiving the material to use it for scientific and non-commercial uses only. In many cases these agreements are included with the regular seed exchange catalogues sent between institutions. Such agreements generally also state that if the receivers wish to use the plant material for commercial purposes, or to distribute such material to other users, that prior informed consent from the country of original supply and other stakeholder must be obtained first.

Although many botanic gardens have distributed plant material accompanied by data on their origin (from the wild and otherwise), in many cases (perhaps even in a majority of cases), source data has been lost. Often details of the original localities from which many botanic garden living collections were made have been lost as collections have been passed from garden to garden around the world.

During the last few decades many botanic gardens have given high priority to the development of efficient and effective data management systems for their collections, often now using computer databases. These new systems have facilitated better tracking of plant material in a botanic garden to ensure that it is used only in accordance with the original supplier's conditions.

Botanic gardens have also begun to adopt harmonised policies and practices related to providing appropriate access and sharing benefits, to meet CBD requirements.

The *International Agenda for Botanic Gardens in Conservation* (Wyse Jackson and Sutherland 2000) addresses this issue and proposes the following policies for botanic gardens:

The CBD recognises the sovereign rights of States over their natural resources and their authority to determine access to such genetic resources. However, the Convention also states that each Contracting Party shall endeavour to facilitate access to genetic resources for environmentally sound uses by other Contracting Parties and that they are not to impose restrictions that run counter to the objectives of the Convention.

Botanic gardens hold in cultivation representatives of up to one-third of the vascular plant species of the world, much of it collected, received or otherwise obtained before the Convention on Biological Diversity came into effect. Accordingly, botanic gardens have very special responsibilities and obligations to ensure that they facilitate access to their collections for those seeking to use such material for the benefit of biodiversity conservation. Furthermore, it is important that botanic gardens follow fair and ethical policies relating to access to their collections and benefit-sharing that are fully in accordance with the terms of the CBD and relevant national legislation.

The importance of botanic gardens developing mechanisms and sharing benefits derived from the use of their plant collections with relevant stakeholders has also been highlighted under the terms of the Convention on Biological Diversity. In the context of access and benefit-sharing, a stakeholder have been defined as ‘...an individual, organisation or group whether formal or informal, affected by, or with an interest in, the activities relating to the acquisition, use or supply of genetic resources, their progeny or derivatives (Royal Botanic Gardens Kew 1999)’. Stakeholders may include national, regional and local governments, local communities and indigenous groups, organisations and institutions, land-owners and farmers and private individuals.

The types of benefits shared by botanic gardens with stakeholders are many and varied and can include access to collections and information sources, training and technology transfers, in-kind benefits, joint programmes, projects and publications, technical assistance and advice and other activities in support of capacity building and monetary benefits (such as royalties) derived from the use of plant collections for commercial purposes.

Under the CBD, botanic gardens have an obligation to obtain the prior informed consent of stakeholders in the country of origin of genetic resources they wish to obtain, not only relating to their collection of such material but also the proposed uses to which such material will be put. In

practice, such prior informed consent take the form of collecting permits and material acquisition agreements, which define the uses to which plant material covered by the agreement can be put. Such agreements may also cover obligations for the exchange of information derived or resulting from research on, or from, other uses of the material concerned.

Although many plant collections held by botanic gardens were obtained prior to the CBD (and so are not covered by its provisions), many botanic gardens agree that, as far as is practical and reasonable and within the scope of their available resources, they will treat all the genetic resources in their care in a similar manner, implementing ethical policies, facilitating access, identifying stakeholders, and sharing benefits and to support biodiversity conservation.

Botanic gardens should:

- i) Develop, adopt and implement an institutional policy relating to access to their collections, material transfers and benefit-sharing that is fully in accordance with the provisions of the CBD, CITES and any relevant national legislation.
- ii) Develop and implement a Code of Conduct relating to the implementation of institutional policies concerning access and benefit-sharing and ensure that all staff follow this Code of Conduct.
- iii) Facilitate and provide access to their collections for *bona fide* users, particularly to support biodiversity conservation, research, education, display and other activities of public benefit.
- iv) Make sincere and genuine efforts to identify stakeholders related to plant material they wish to source or use, particularly when obtaining material from wild sources; obtain prior informed consent for such collecting activities, and agreement on future uses and the sharing of benefits, if any, derived from such material.
- v) Determine institutional obligations to share benefits with stakeholders nationally and internationally, including the type and extent of benefits to be shared.
- vi) Ensure that Material Transfer Agreements are recognised and accepted at a national level and agreed with all stakeholders.
- vii) Promote the fair and equitable sharing of the benefits arising from the use of the genetic resources in their collections (including their progeny and derivatives) with the country of origin of the material and other relevant stakeholders.
- viii) Develop appropriate procedures and mechanisms within the garden to:
 - record and maintain data on access and benefit-sharing related to their plant accessions
 - track the movement and use of genetic resources within the institution and between different institutions
 - identify and share benefits derived from the use of genetic resources to ensure that such use is in accordance with the provisions of the CBD and any agreements entered into by the garden governing their use of such material.
- ix) Communicate their policies and practices on access and benefit-sharing to other relevant sectors such as government, private industry, the scientific community and non-government organisations.
- x) Seek to influence national policy makers developing regulations relating to access to genetic resources about the importance of noting the distinctions between the use of genetic resources for scientific research, and for commercial purposes.
- xi) Support, encourage and assist other institutions with which they work to develop, adopt and implement policies relating to access and benefit-sharing.
- xii) Seek to harmonise their policies on access and benefit-sharing with other institutions with which they work and in line with their relevant national legislation.

- xiii) Raise public awareness about the importance and need to share benefits derived from the use of genetic resources as a means to generate and apply new resources to biodiversity conservation.

BGCI is currently promoting the wide endorsement of the *International Agenda for Botanic Gardens in Conservation* by botanic gardens throughout the world, to help ensure that their response to and implementation of the provisions of the CBD in this and other areas will be effective and in accordance with the Convention and any relevant national legislation.

8.1. "Botanic Garden Policy on Access to Genetic Resources and Benefit-Sharing"

Since 1998 a pilot project on the development of harmonised policies for botanic gardens specifically related to access and benefit-sharing has been implemented by a group of botanic gardens and their network organisations, under the leadership of the Royal Botanic Gardens Kew. This has involved the preparation of harmonised policy guidelines for botanic gardens throughout the world.

Botanic gardens from the following countries have been involved: Australia, Brazil, Cameroon, Canada, China, Colombia, Germany, Ghana, Malaysia, Mexico, Morocco, the Russian Federation, Spain, South Africa, the United Kingdom and the United States, as well as BGCI and the International Association of Botanic Gardens (IABG).

The policy guidelines were agreed in 2000 and now enter a phase where botanic gardens around the world will be encouraged and supported to implement such policies for their own institutions.

A copy of the policy guidelines are available at the following web address:

<http://www.rbg.ca/cbcn>

Ensuring that botanic gardens manage their collections fully in accordance with the principles and provisions of the Convention on Biological Diversity is a challenge for most institutions, but it is one being approached with determination, good will and where necessary, with the pragmatism that will be required to ensure that the botanic garden ex situ collections meet their full potential to support the implementation of the objectives of the Convention.

9.0 Extent of collections

This re-assessment of botanic garden ex situ collections has provided a new estimate of over 6 million living plant accessions held in botanic gardens worldwide.

The report also contains an estimate of the number of accessions in cultivation in each collection, as far as can be determined. These totals have then been summed and adjusted to take into account those institutions where detailed figures are not available, to provide a reasonable estimate for the total number of accessions in each country.

In every case, the number of accessions in a collection is equal or greater than the total number of taxa recorded in a collection. However, some institutions maintain multiple collections of the same taxa and so their total number of accessions may be several times greater than the total of taxa in the collection. In some instances BGCi has sourced data on the number of taxa and accessions held in a collection. In other cases estimates have been made based on our knowledge of the individual institutions or on information provided by other individuals or from published sources. For some institutions and countries our knowledge of the collections is so scanty as to make it impossible even to estimate a possible likely number of accessions in a country. In those cases, we have had to presume that no collections are held and exclude them from the calculations.

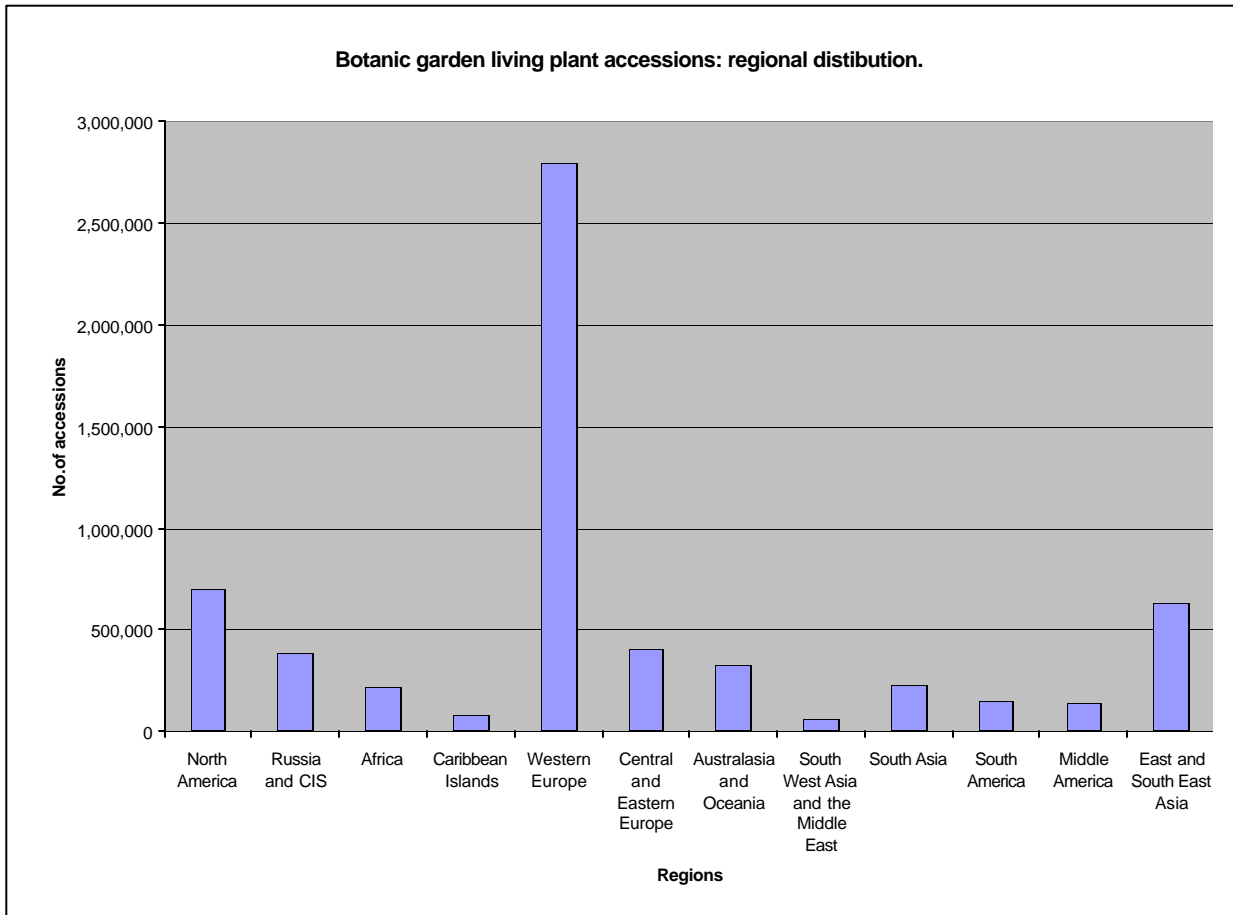
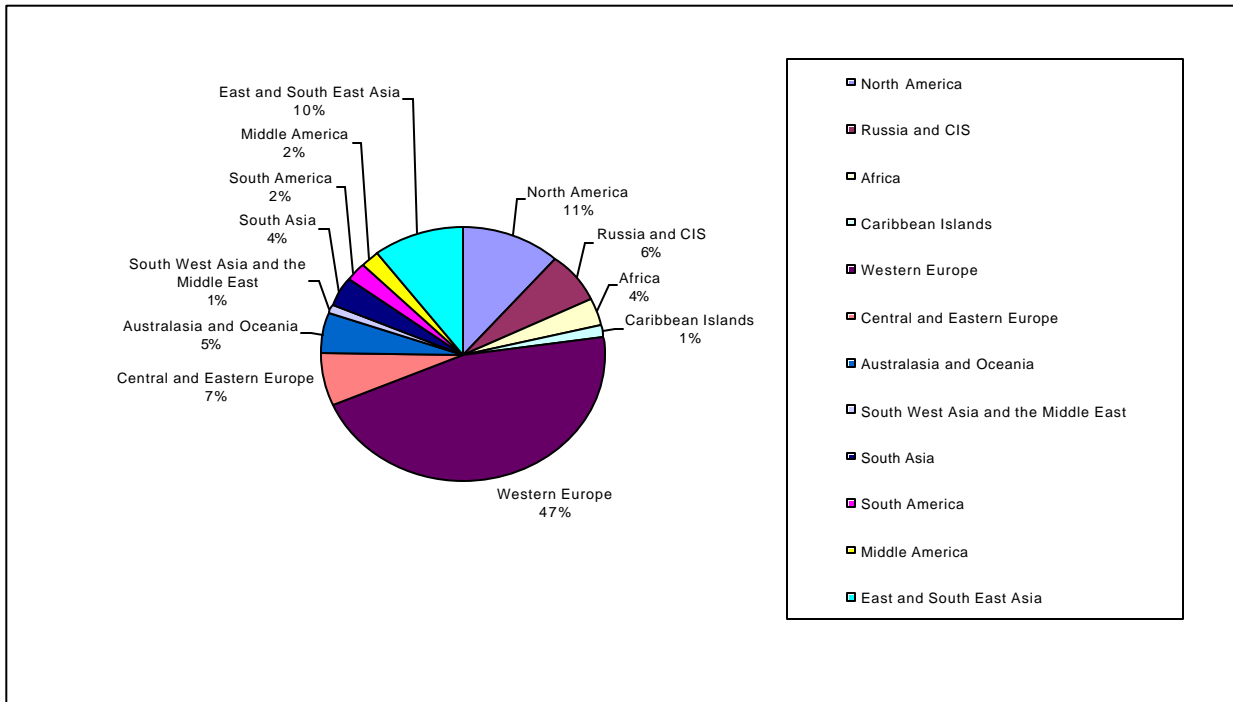
For that reason the final total of more than 6 million accessions of living plants in botanic gardens worldwide must be regarded as extremely conservative and a true figure may be as much as 20% to 50% higher.

As Table 9.1 and Figure 9.1 show, the distribution of accessions in botanic gardens worldwide is uneven. The majority of collections are in Europe and North America (making up over 50% of the total). The collections in most tropical and developing countries are significantly smaller than those in many temperate countries. This is partly due to an imbalance of institutional resources between such regions, but also due to the fact that many of the botanic gardens in tropical and developing countries are younger institutions without the long history of development as in many European countries, that has allowed the development of extensive collections built up over decades, and sometimes centuries.

TABLE 9.1 Botanic garden living plant accessions – estimated numbers worldwide and their distribution

North America	700,000
Russia and CIS countries	389,500
Africa and Indian Ocean Islands	216,600
Caribbean Islands	86,100
Western Europe	2,800,500
Central and Eastern Europe	404,000
Australasia and Oceania	331,500
South West Asia and the Middle East	58,500
South Asia	224,000
South America	145,500
Middle America	138,700
East and South East Asia	636,000
TOTAL	6,130,900

Figure 9.1: Botanic Garden living plant accessions – estimated world distribution.



10.0 Strengths in the botanic gardens living collections worldwide

Over the last few decades there has been an increasing trend amongst botanic gardens to cultivate native plants of their own regions. Many botanic gardens have also assumed special responsibilities for the cultivation of rare and endangered plants and other taxa of conservation importance. In some cases botanic gardens concentrate on the development of their collections following particular thematic, taxonomic and geographical lines, including the broad categories outlined below. It should be stressed however, that this list is by no means complete and it should not be suggested that the botanic gardens are either largely focused on such thematic collections or that they do not maintain extensive collections of groups that fall outside of any of the categories listed.

The following broad categories are well represented in the worldwide botanic garden ex situ collections:

Thematic collections

- Alpine and rock garden plants
- Aromatic plants
- Bonsai
- Bulbs and other geophytes
- Carnivorous plants
- Medicinal plants
- Ornamental plants (including cultivars and their wild progenitors)
- Rare and endangered plants
- Temperate fruits
- Temperate herbaceous perennials
- Temperate trees, shrubs and climbers
- Tropical fruits (particularly fruit trees)
- Tropical timber trees
- Tropical flowering and other ornamental trees and shrubs
- Wild crop relatives
- Xerophytes

Taxonomic collections

- A wide range of temperate woody families (such as the Aceraceae, Betulaceae, Fagaceae, Rosaceae, etc).
- Aroids
- Bromeliads
- Cacti
- Conifers
- Crassulaceae
- Cycads
- Euphorbiaceae
- Ferns
- Ficus
- Grasses (including bamboos)
- Leguminosae
- Orchids
- Palms
- Rhododendrons

Geographical collections

- Native plants of temperate North America, Europe, Asia
- Woody native plants of temperate Australia, New Zealand and South America
- Plants of mediterranean regions of Europe, Southern Africa, South America and Australia.
- Island plants, such as from Macaronesia, the Mascarene Islands, New Zealand, Japan and Hawaii.
- Plants of the mountains of Europe, North America and Asia.

Less well represented in botanic garden collections are the floras of tropical continental South America, Southeast Asia and Africa and other countries where there are still a limited range and number of botanic gardens.

11.0 Determining the diversity of the worldwide botanic garden collection

In October 1999, BGCI obtained the support of the Stanley Smith Horticultural Trusts (in the U.K. and the U.S.A.) to prepare the first ever preliminary checklist of plant taxa in cultivation in the botanic gardens of the world.

BGCI estimates that in excess of 80,000 plant species are now in cultivation in botanic gardens worldwide. However, until now, it has been more or less impossible to determine in an accurate way what and how many species are represented amongst this total, where each species is grown and the extent to which duplication occurs between collections. The increasing use of computers to document living plant collections in botanic gardens around the world has made it possible for the first time to gain an accurate overview of plants in cultivation by undertaking direct comparisons and compilations of accession records being maintained by collection holders wherever they may be. Initial work undertaken by BGCI between 1999 and 2001 has located in excess of 45,000 different plant species in cultivation in botanic gardens. This has been achieved by electronically sorting and compiling data sets received from botanic gardens in several countries. To date, datasets from about 60 botanic gardens have been analysed for incorporation in the proposed checklist.

Until the work on the global checklist of plants in cultivation in botanic gardens has been completed in 2002 the current estimate of 80,000 species in cultivation in botanic gardens will remain as the most accurate current overview of the extent of their collections. If the number of taxa in cultivation is estimated (including species, subspecies, cultivars, varieties, forma, hybrids and other identifiable entities) the number is probably double that total, i.e. 160,000 taxa.

An estimate of the total number of taxa (and species) has been included where possible for each country and territory in the review presented here. These range from a very small total number of taxa in the botanic gardens in many smaller developing countries, to an estimated 50,000 species in the botanic gardens of both Germany and the U.K. and large totals in other countries such as Australia, China, France, Italy, Russia and the United States.

12.0 Botanic garden herbaria

A high percentage of the botanic gardens of the world either contain, include or are closely associated with herbaria. The largest herbaria are generally found in the oldest and largest botanical institutions in each country and region. Many contain diverse, historic and irreplaceable scientific resources documenting the world's plant diversity. For historic reasons, many original collections and much type material on which plant names have been based are housed in herbaria outside the natural range of the species concerned. To facilitate scientific research most herbaria have a policy to provide free access to their collections to bona fide users for the purposes of scientific study. Although the majority of specimens preserved in botanic garden herbaria are of vascular plants, some important collections of non-vascular plants (e.g. bryophytes), algae and fungi are also maintained by several botanic gardens.

Major botanic garden herbaria include the following:

- Museum National d'Histoire Naturelle, Paris, France (8,000,000 specimens)
- The Royal Botanic Gardens Kew, U.K. (7,000,000 specimens)
- Conservatoire et Jardin Botaniques, Geneva, Switzerland (6,000,000 specimens)
- New York Botanical Garden, U.S.A. (5,600,000 specimens)
- Komarov Botanical Institute and Botanic Garden, St Petersburg, Russia (5,000,000 specimens)
- Missouri Botanical Garden, St Louis, U.S.A. (3,500,000 specimens)
- Jena University Botanic Garden, Germany (2,800,000 specimens)
- University of Helsinki Botanic Garden, Finland (2,720,000 specimens)
- Copenhagen University Botanic Garden, Denmark (2,500,000 specimens)
- Beijing Botanic Garden, China (2,400,000 specimens)
- Kebun Raya Bogor, Indonesia (2,000,000 specimens)
- The Berlin Dahlem Botanic Garden (2,000,000 specimens)
- Uppsala University Botanic Garden, Sweden (2,000,000 specimens)
- Institute of Botany, Pruhonice, Czech Republic (2,000,000 specimens)
- Royal Botanic Garden Edinburgh, U.K. (2,000,000 specimens)
- National Botanic Garden of Belgium (2,000,000 specimens)
- University of Tokyo Botanic Garden, Japan (1,500,000 specimens)
- Indian Botanic Garden, Calcutta, India (1,500,000 specimens)
- Goteborg Botanic Garden, Sweden (1,350,000 specimens)
- Botanischer Garten der Universitat Wien, Vienna, Austria (1,300,000 specimens)
- University of Oslo Botanic Garden, Norway (1,300,000 specimens)
- Pretoria National Botanic Garden, South Africa (1,200,000 specimens)
- Melbourne Botanic Garden, Australia (1,170,000 specimens)
- Sydney Botanic Gardens, Australia (1,000,000 specimens)

The combined totals of numbers of specimens in botanic garden herbaria included in Part II of this report is over **142,000,000** (142 million) herbarium specimens.

As there are many herbaria where we could not locate figures for the numbers of specimens they contain, the actual total is probably in the region of 150 million specimens.

13.0 References

The following list of references include ones that are specifically referred to in the text of Part I of this report, as well as those that relate more broadly to the general management, development and maintenance of botanic garden ex situ collections.

Important references on the botanic gardens in particular countries are provided in the report under the botanic garden entries for those countries.

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14.0 Websites for botanic gardens

There is no single international gateway site for botanic garden websites, although the future development of such a site is a stated aim of Botanic Gardens Conservation International. In the last few years there has been a very rapid development in the number of botanic gardens that provide information on the World Wide Web. While the majority of these are in Europe, North America and Australasia, a significant number of botanic gardens in other regions now have a web presence. The use of the internet by botanic gardens is currently undergoing considerable development and expansion and for that reason the compilation of a comprehensive directory of individual botanic garden web sites would be extremely difficult and time consuming at the present time and would very soon become out of date. As an alternative we have provided a selection of some useful web addresses which may be used to source individual botanic garden web sites.

International botanic garden links

- www.bgci.org.uk (BGCI's U.K. based website.)
- www.biologie.uni-ulm.de/systax/infgard/gardens
- www.botany.net
- www.garden.web.com
- www.tau.ac.il/lifesci/botany/gardens.htm

Australian Botanic Gardens

- www.anbg.gov.au
- <http://155.187.10.12/chabg/bg-dir/index.html>

Austria

- <http://www.botanik.univie.ac.at/hbv/deutsch/oebotgar.htm>

Germany

- <http://www.biologie.uni-ulm.de/verband/>
- www.botanik.uni-bonn.de/botgart/f+e_home.htm

Italy

- <http://astr17pi.dfi.unipi.it/Horti/>

New Zealand

- www.gardens.co.nz/gardenstovisit/index.html

Northern America

- www.bgci.org BGCI (U.S.)
- www.botanique.com
- <http://www.rbg.ca/cbcn> Canadian Botanical Conservation Network
- www.mobot.org/CPC/ Center for Plant Conservation
- www.aabga.org American Association of Botanic Gardens and Arboreta's membership list
- www.libertynet.org/gardens/index.htm The Gardens Collaborative
- www.yahoo.com Search for botanic gardens by city name and state)
- www.ilovegardens.com

Russia

- www.bgci.ru BGCI-Russia (Moscow Division) web site

South Africa

- www.nbi.ac.za/homepage.htm
- www.nbi.ac.za/frames/linksfram.htm

Switzerland

- <http://www.botanischergarten.ch/>

UK

- www.plantnet.org

15.0 Summary of Botanic Garden Ex situ Collections Worldwide

Country synopsis of botanic gardens, accessions and taxa in cultivation and estimated percentage of collections that pre-date the Convention on Biological Diversity

Albania

Total no. of Botanic Gardens recorded in Albania: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: 2,000
Approx. no. of taxa (species) in these collection: 2,000
Estimated % of pre-CBD collections: 95%

Algeria

Total no. of Botanic Gardens recorded in Algeria: 3.
Approx. no. of living plant accessions recorded in these botanic gardens: 10,000
Approx. no. of taxa (species) in these collections: 8,000
Estimated % of pre-CBD collectionS: 90%

Angola

Total no. of Botanic Gardens recorded in Angola: 1
Approx. no. of living plant accessions recorded in these botanic gardens: +500
Approx. no. of taxa (species) in these collections: 500
Estimated % of pre-CBD collections: Unknown

Antigua/Barbuda

Total no. of Botanic Gardens recorded in Antigua/Barbuda: 1
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.
Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections- Probably>90%

Argentina

Total no. of Botanic Gardens recorded in Argentina: 26.
Approx. no. of living plant accessions recorded in these botanic gardens: +20,000.
Approx. no. of taxa (species) in these collections 10,000 (6,000 spp.).
Estimated % of pre-CBD collections: 90%

Armenia

Total no. of Botanic Gardens recorded in Armenia: 3.
Approx. no. of living plant accessions recorded in these botanic gardens: c.6,000
Approx. no. of taxa (species) in these collections: 4,000
Estimated % of pre-CBD collections: 95%

Australia

Total no. of Botanic Gardens recorded in Australia: 128.
Approx. no. of living plant accessions recorded in these botanic gardens: >250,000.
Approx. no. of taxa (species) in these collections: 25,000 (15,000 spp.)
Estimated % of pre-CBD collections: 85%.

(Norfolk Island (1) – included in Australia total)

Austria

Total no. of Botanic Gardens recorded in Austria: 18
Approx. no. of living plant accessions recorded in these botanic gardens: c.60,000
Approx. no. of taxa (species) in these collections: c.25,000
Estimated % of pre-CBD collections: c.90%

Azerbaijan

Total no. of Botanic Gardens recorded in Azerbaijan: 3.
Approx. no. of living plant accessions recorded in these botanic gardens: 4,500
Approx. no. of taxa (species) in these collections: 3,000.
Estimated % of pre-CBD collections: 90%

Bahamas

Total no. of Botanic Gardens recorded in the Bahamas: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.
Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections: Unknown.

Bangladesh

Total no. of Botanic Ga rdens recorded in Bangladesh: 4.
Approx. no. of living plant accessions recorded in these botanic gardens: c.4,000
Approx. no. of taxa (species) in these collections: 2,000
Estimated % of pre-CBD collections: 90%

Barbados

Total no. of Botanic Gardens recorded in Barbados: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: Up to 10,000
Approx. no. of taxa (species) in these collections: Probably c.5,000.
Estimated % of pre-CBD collections: 70%

Belarus

Total no. of Botanic Gardens recorded in Belarus: 7.
Approx. no. of living plant accessions recorded in these botanic gardens: 15,000.
Approx. no. of taxa (species) in these collections: 10,000
Estimated % of pre-CBD collections: 90%

Belgium

Total no. of Botanic Gardens recorded in Belgium: 28.
Approx. no. of living plant accessions recorded in these botanic gardens: c.50,000
Approx. no. of taxa (species) in these collections: c.20,000

Estimated % of pre-CBD collections: 90%

Belize

Total no. of Botanic Gardens recorded in Belize: 2 (+ 2 developing projects).
Approx. no. of living plant accessions recorded in these botanic gardens: 2,500
Approx. no. of taxa (species) in these collections: 400
Estimated % of pre-CBD collections: 60%

Benin

Total no. of Botanic Gardens recorded in Benin: 2 (+1 of uncertain status).
Approx. no. of living plant accessions recorded in these botanic gardens: c. 3,000
Approx. no. of taxa (species) in these collections: 1,500
Estimated % of pre-CBD collections: Perhaps 90%

Bhutan

Total no. of Botanic Gardens recorded in Bhutan: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.
Approx. no. of taxa (species) in these collections: Unknown
Estimated % of pre-CBD collections: Most collections post-date CBD as this is a new botanic garden project.

Bolivia

Total no. of Botanic Gardens recorded in Bolivia: 4.
Approx. no. of living plant accessions recorded in these botanic gardens: c.3,000
Approx. no. of taxa (species) in these collections: c.1,000
Estimated % of pre-CBD collections: Perhaps 60%.

Bosnia Herzegovina

Total no. of Botanic Gardens recorded in Bosnia Herzegovina: 4.
Approx. no. of living plant accessions recorded in these botanic gardens: Probably c.5,000
Approx. no. of taxa (species) in these collections: Probably 2,000 to 3,000.
Estimated % of pre-CBD collections 50%.

Botswana

Total no. of Botanic Gardens recorded in Botswana: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown
Approx. no. of taxa (species) in these collections: Unknown
Estimated % of pre-CBD collections: Unknown

Brazil

Total no. of Botanic Gardens recorded in Brazil: 29 (+ several of uncertain status).
Approx. no. of living plant accessions recorded in these botanic gardens: c.50,000
Approx. no. of taxa (species) in these collections: c.7,000.
Estimated % of pre-CBD collections: Perhaps 75%.

Bulgaria

Total no. of Botanic Gardens recorded in Bulgaria: 9.
Approx. no. of living plant accessions recorded in these botanic gardens: c.15,000
Approx. no. of taxa (species) in these collections: c.5,000-8,000.
Estimated % of pre-CBD collections: Probably 80% to 90%.

Burma (Myanmar)

Total no. of Botanic Gardens recorded in Burma: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.
Approx. no. of taxa (species) in these collections: Unknown
Estimated % of pre-CBD collections: Unknown.

Burundi

Total no. of Botanic Gardens recorded in 2.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown
Approx. no. of taxa (species) in these collections: Unknown
Estimated % of pre-CBD collections: Unknown.

Cameroon

Total no. of Botanic Gardens recorded in Cameroon: 4.
Approx. no. of living plant accessions recorded in these botanic gardens: c.5,000
Approx. no. of taxa (species) in these collections: c.3,000
Estimated % of pre-CBD collections: 80% to 90%.

Canada

Total no. of Botanic Gardens recorded in Canada: 59 (+ 37 additional gardens with ex situ plant collections).
Approx. number of living plant accessions recorded in these botanic gardens: >100,000
Approx. number of taxa (species) in these collections: c.30,000 (10,000 15,000 spp.)
Estimated % of pre-CBD collections: 90%

Cape Verde Islands

Total no. of Botanic Gardens recorded in the Cape Verde Islands: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: <500.
Approx. no. of taxa (species) in these collections: c.100.
Estimated % of pre-CBD collections: 25%

Chile

Total no. of Botanic Gardens recorded in Chile: 9.
Approx. no. of living plant accessions recorded in these botanic gardens: <10,000
Approx. no. of taxa (species) in these collections: c. 5,000
Estimated % of pre-CBD collections: 80-90%

China

Total no. of Botanic Gardens recorded in the People's Republic of China: 106 (including Hong Kong (5) and Macao (1).

Approx. no. of living plant accessions recorded in these botanic gardens: c.200,000

Approx. no. of taxa (species) in these collections: 30,000 to 35,000 (c.25,000 spp.).

Estimated % of pre-CBD collections: 70% to 80%.

(Republic of China – see Taiwan)

Colombia

Total no. of Botanic Gardens recorded in Colombia: 25
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably c.50,000

Approx. no. of taxa (species) in these collections: Unknown but probably c.12,000 to 15,000 (c.10,000 spp).

Estimated % of pre-CBD collections: Unknown but perhaps 30%

Costa Rica

Total no. of Botanic Gardens recorded in Costa Rica: 4.
Approx. no. of living plant accessions recorded in these botanic gardens: c.20,000

Approx. no. of taxa (species) in these collections: 7,000 to 8,000.

Estimated % of pre-CBD collections: 80%

Croatia

Total no. of Botanic Gardens recorded in Croatia: 14.

Approx. no. of living plant accessions recorded in these botanic gardens: c.20,000

Approx. no. of taxa (species) in these collections: 10,000 to 12,000.

Estimated % of pre-CBD collections: 90%

Cuba

Total no. of Botanic Gardens recorded in Cuba: 11.

Approx. no. of living plant accessions recorded in these botanic gardens: c.30,000

Approx. no. of taxa (species) in these collections: 6,000 (c.4,000 spp.).

Estimated % of pre-CBD collections: 60% -70%

Czech Republic

Total number of Botanic Gardens recorded in the Czech Republic: 25.

Approx. no. of living plant accessions recorded in these botanic gardens: c.60,000.

Approx. no. of taxa (species) in these collections: Up to 15,000 (c.10,000 spp.).

Estimated % of pre-CBD collections: 90%.

Democratic Republic of Congo (formerly Zaire)

Total no. of Botanic Gardens recorded in the Democratic Republic of the Congo: 2.

Approx. no. of living plant accessions recorded in these botanic gardens: 6,000

Approx. no. of taxa (species) in these collections: up to 5,000 (2,500 spp.).

Estimated % of pre-CBD collections: 90%.

(Democratic Republic of Korea – see North Korea)

Denmark

Total no. of Botanic Gardens recorded in Denmark: 9.

Approx. no. of living plant accessions recorded in these botanic gardens: 60,000 to 70,000.

Approx. no. of taxa (species) in these collections: c.15,000 (12,000 spp.)

Estimated % of pre-CBD collections: 80%.

Dominica

Total no. of Botanic Gardens recorded in Dominica: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: c.1,000

Approx. no. of taxa (species) in these collections: 750 (500 spp.)

Estimated % of pre-CBD collections: 95%

Dominican Republic

Total no. of Botanic Gardens recorded in the Dominican Republic: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: Up to 10,000

Approx. no. of taxa (species) in these collections: Perhaps 5,000.

Estimated % of pre-CBD collections: 75%.

Ecuador

Total no. of Botanic Gardens recorded in Ecuador: 6.

Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.

Approx. no. of taxa (species) in these collections: Unknown, perhaps 2,000 to 3,000.

Estimated % of pre-CBD collections: 50%

Egypt

Total no. of Botanic Gardens recorded in Egypt: 6.

Approx. no. of living plant accessions recorded in these botanic gardens: <10,000

Approx. no. of taxa (species) in these collections: c.3,000 (2,000 spp.)

Estimated % of pre-CBD collections: 90% - 95%

El Salvador

Total no. of Botanic Gardens recorded in El Salvador: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: c.5,000

Approx. no. of taxa (species) in these collections: 3,500

Estimated % of pre-CBD collections: 85%

Estonia

Total no. of Botanic Gardens recorded in Estonia: 3.

Approx. no. of living plant accessions recorded in these botanic gardens: Up to 15,000
Approx. no. of taxa (species) in these collections: c.8,000 (5,000 spp.)
Estimated % of pre-CBD collections: 85%

Ethiopia

Total no. of Botanic Gardens recorded in Ethiopia: 3.
Approx. no. of living plant accessions recorded in these botanic gardens: 1,000 to 2,000
Approx. no. of taxa (species) in these collections: <1,000
Estimated % of pre-CBD collections: 90%

Fiji

Total no. of Botanic Gardens recorded in Fiji: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.
Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections: Unknown.

Finland

Total no. of Botanic Gardens recorded in Finland: 8.
Approx. no. of living plant accessions recorded in these botanic gardens: c.25,000
Approx. no. of taxa (species) in these collections: c.8,000
Estimated % of pre-CBD collections: 80% to 90%

France

Total no. of Botanic Gardens recorded in France: 104, plus 10 in French Overseas Territories (French Guiana, Guadeloupe, Martinique and Réunion).
Approx. no. of living plant accessions recorded in these botanic gardens: c. 300,000.
Approx. no. of taxa (species) in these collections: 30,000 to 40,000 (20,000 to 25,000 spp.).
Estimated % of pre-CBD collections: 80% -90%

(French Guiana)

Total no. of Botanic Gardens recorded in French Guiana: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.
Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections: Unknown.

(Guadeloupe)

Total no. of Botanic Gardens recorded in Guadeloupe: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: c.1,000
Approx. no. of taxa (species) in these collections: c.500
Estimated % of pre-CBD collections: 60% to 80%.

(Martinique)

Total no. of Botanic Gardens recorded in Martinique: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: c.4,000
Approx. no. of taxa (species) in these collections: 3,000

Estimated % of pre-CBD collections: 90%

(Réunion)

Total no. of Botanic Gardens recorded in La Réunion: 4.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably up to 10,000
Approx. no. of taxa (species) in these collections: Unknown but probably 5,000 to 6,000.
Estimated % of pre-CBD collections: Unknown.

Gabon

Total no. of Botanic Gardens recorded in Gabon: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: <500
Approx. no. of taxa (species) in these collections: 40
Estimated % of pre-CBD collections: 90 to 100%.

Gambia

Total no. of Botanic Gardens recorded in Gambia: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown
Approx. no. of taxa (species) in these collections: Unknown
Estimated % of pre-CBD collections: Unknown.

Georgia

Total no. of Botanic Gardens recorded in Georgia: 6.
Approx. no. of living plant accessions recorded in these botanic gardens: 15,000 to 20,000
Approx. no. of taxa (species) in these collections: 5,000 to 6,000
Estimated % of pre-CBD collections: 80% to 90%.

Germany

Total no. of Botanic Gardens recorded in Germany: 102.
Approx. no. of living plant accessions recorded in these botanic gardens: 550,000 to 650,000
Approx. no. of taxa (species) in these collections: c.50,000
Estimated % of pre-CBD collections: 75% to 90%.

Ghana

Total no. of Botanic Gardens recorded in Ghana: 5.
Approx. no. of living plant accessions recorded in these botanic gardens: Up to 5,000
Approx. no. of taxa (species) in these collections: c. 3,000
Estimated % of pre-CBD collections: 90%

Greece

Total no. of Botanic Gardens recorded in Greece: 4 (and several other significant garden plant collections and some developing projects)
Approx. no. of living plant accessions recorded in these botanic gardens: <10,000
Approx. no. of taxa (species) in these collections: up to 5,000 (c. 3,000 spp.)
Estimated % of pre-CBD collections: c. 80%

Grenada

Total no. of Botanic Gardens recorded in Grenada: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: Unknown
Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections: Probably c.95%

Guatemala

Total no. of Botanic Gardens recorded in Guatemala: 1 (and 1 project of uncertain status)
Approx. no. of living plant accessions recorded in these botanic gardens: c. 1,200
Approx. no. of taxa (species) in these collections: c. 800-900 (700 spp.).
Estimated % of pre-CBD collections: Probably about 85%

Guyana

Total no. of Botanic Gardens recorded in Guyana: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: < 1,000
Approx. no. of taxa (species) in these collections: 300 to 400 (spp.).
Estimated % of pre-CBD collections: 95%

Honduras

Total no. of Botanic Gardens recorded in Honduras: 3.
Approx. no. of living plant accessions recorded in these botanic gardens: Probably c. 10,000
Approx. no. of taxa (species) in these collections: Probably c. 4,000 (2,500 spp.)
Estimated % of pre-CBD collections: 90%

Hungary

Total no. of Botanic Gardens recorded in Hungary: 22
Approx. no. of living plant accessions recorded in these botanic gardens: 60,000 to 70,000.
Approx. no. of taxa (species) in these collections: 15,000 to 20,000 (10,000 to 15,000 spp.)
Estimated % of pre-CBD collections: Unknown but probably 80% to 90%.

Iceland

Total no. of Botanic Gardens recorded in Iceland: 2.
Approx. no. of living plant accessions recorded in these botanic gardens <10,000
Approx. no. of taxa (species) in these collections: 4,000 to 5,000.
Estimated % of pre-CBD collections: Unknown, perhaps 75%.

India

Total no. of Botanic Gardens recorded in India: 122.
Approx. no. of living plant accessions recorded in these botanic gardens: c.200,000
Approx. no. of taxa (species) in these collections: 15,000 to 20,000 (7,000 to 10,000 spp.)
Estimated % of pre-CBD collections: 90%

Indonesia

Total no. of Botanic Gardens recorded in Indonesia: 5

Approx. no. of living plant accessions recorded in these botanic gardens: 80,000
Approx. no. of taxa (species) in these collections: 25,000
Estimated % of pre-CBD collections: 90%

Iran

Total no. of Botanic Gardens recorded in Iran: 6 (plus 4 projects).
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably c.10,000
Approx. no. of taxa (species) in these collections: Unknown but probably up to 3,000
Estimated % of pre-CBD collections: Unknown.

Iraq

Total no. of Botanic Gardens recorded in Iraq: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: <1,000
Approx. no. of taxa (species) in these collections: 230
Estimated % of pre-CBD collections: 95%.

Ireland

Total no. of Botanic Gardens recorded in the Republic of Ireland: 10.
Approx. no. of living plant accessions recorded in these botanic gardens: 50,000 to 60,000.
Approx. no. of taxa (species) in these collections: 25,000 to 30,000 (c.10,000 to 15,000 spp.).
Estimated % of pre-CBD collections: 90%

Israel

Total no. of Botanic Gardens recorded in Israel: 8.
Approx. no. of living plant accessions recorded in these botanic gardens: c.8,000
Approx. no. of taxa (species) in these collections: 3,500
Estimated % of pre-CBD collections: 90%

Italy

Total no. of Botanic Gardens recorded in Italy: 107.
Approx. no. of living plant accessions recorded in these botanic gardens: 400,000 to 500,000
Approx. no. of taxa (species) in these collections: c.15,000 (c.12,000).
Estimated % of pre-CBD collections: 90% to 95%

Ivory Coast (Côte d'Ivoire)

Total no. of Botanic Gardens recorded in the Ivory Coast: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Up to 2,000
Approx. no. of taxa (species) in these collections: 1,200
Estimated % of pre-CBD collections: 90%

Jamaica

Total no. of Botanic Gardens recorded in Jamaica: 5.
Approx. no. of living plant accessions recorded in these botanic gardens: <5,000
Approx. no. of taxa (species) in these collections: c.1,000 to 2,000

Estimated % of pre-CBD collections: 90%

Japan

Total no. of Botanic Gardens recorded in Japan: 55.
Approx. no. of living plant accessions recorded in these botanic gardens: 150,000 to 200,000
Approx. no. of taxa (species) in these collections: 16,000 to 18,000 (perhaps 12,000 spp.).
Estimated % of pre-CBD collections: Unknown, perhaps 75% or more.

Kazakhstan

Total no. of Botanic Gardens recorded in Kazakhstan: 9.
Approx. no. of living plant accessions recorded in these botanic gardens: c.20,000
Approx. no. of taxa (species) in these collections: Up to 10,000 (perhaps 5,000 to 6,000 spp.).
Estimated % of pre-CBD collections: 90%

Kenya

Total no. of Botanic Gardens recorded in Kenya: 9.
Approx. no. of living plant accessions recorded in these botanic gardens: <10,000
Approx. no. of taxa (species) in these collections: Unknown but probably 2,000 to 3,000.
Estimated % of pre-CBD collections: 50% to 60%

(*Korea – see North Korea and South Korea*)

Kuwait

Total no. of Botanic Gardens recorded in Kuwait: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.
Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections: Unknown but probably less than 50%

Kyrgyzstan

Total no. of Botanic Gardens recorded in Kyrgyzstan: 4.
Approx. no. of living plant accessions recorded in these botanic gardens: 15,000 to 20,000
Approx. no. of taxa (species) in these collections: 10,000
Estimated % of pre-CBD collections: 90%

Latvia

Total no. of Botanic Gardens recorded in Latvia: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: Up to 30,000
Approx. no. of taxa (species) in these collections: Up to 18,000 (c. 8,000 to 10,000 spp.).
Estimated % of pre-CBD collections: 80%

Lesotho

Total no. of Botanic Gardens recorded in Lesotho: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: Up to 1,000
Approx. no. of taxa (species) in these collections: c.500
Estimated % of pre-CBD collections: Unknown.

Liberia

Total no. of Botanic Gardens recorded in Liberia: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Very few – this is a new botanic garden.
Approx. no. of taxa (species) in these collections: Unknown
Estimated % of pre-CBD collections: 0%.

Libya

Total no. of Botanic Gardens recorded in Libya: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: +400.
Approx. no. of taxa (species) in these collections: 400
Estimated % of pre-CBD collections: 95%.

Lithuania

Total no. of Botanic Gardens recorded in Lithuania: 6.
Approx. no. of living plant accessions recorded in these botanic gardens: 15,000 to 20,000
Approx. no. of taxa (species) in these collections: 7,000 to 8,000 (c.4,000 spp.)
Estimated % of pre-CBD collections: 80%

Luxembourg

Total no. of Botanic Gardens recorded in Luxembourg: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: c.500
Approx. no. of taxa (species) in these collections: 400
Estimated % of pre-CBD collections: 60%

Macedonia (FYOM)

(*Former Yugoslav Republic of Macedonia*)
Total no. of Botanic Gardens recorded in Macedonia: 7.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown
Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections: Unknown.

Madagascar

Total no. of Botanic Gardens recorded in Madagascar: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: c.6,000 to 7,000
Approx. no. of taxa (species) in these collections: c.5,000
Estimated % of pre-CBD collections: 80% to 90%

Malawi

Total no. of Botanic Gardens recorded in Malawi: 4
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably 5,000 to 10,000
Approx. no. of taxa (species) in these collections: Unknown but perhaps 3,000 to 4,000
Estimated % of pre-CBD collections: Unknown but perhaps 60% to 70%.

Malaysia

Total no. of Botanic Gardens recorded in Malaysia: 10.

Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably 5,000 to 10,000
Approx. no. of taxa (species) in these collections: Unknown but probably 4,000 to 6,000 (c. 3,000 spp).
Estimated % of pre-CBD collections: Unknown but perhaps 80% to 90%

Malta

Total no. of Botanic Gardens recorded in Malta: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: c.10,000
Approx. no. of taxa (species) in these collections: 8,000.
Estimated % of pre-CBD collections: 90%

Mauritius

Total no. of Botanic Gardens recorded in Mauritius: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: c.2,000.
Approx. no. of taxa (species) in these collections: c.1,500
Estimated % of pre-CBD collections: c.95%

Mexico

Total no. of Botanic Gardens recorded in Mexico: 89.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably c. 100,000
Approx. no. of taxa (species) in these collections: Unknown but perhaps 10,000 (8,000 spp.).
Estimated % of pre-CBD collections: 80%.

Moldova

Total no. of Botanic Gardens recorded in Moldova: 3.
Approx. no. of living plant accessions recorded in these botanic gardens: <15,000
Approx. no. of taxa (species) in these collections: c12,000 (probaby c.7,000 spp.).
Estimated % of pre-CBD collections: c.90%

Monaco

Total no. of Botanic Gardens recorded in Monaco: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: <10,000.
Approx. no. of taxa (species) in these collections: c. 7,000
Estimated % of pre-CBD collections: 90%

Mongolia

Total no. of Botanic Gardens recorded in Mongolia: (1, status uncertain).
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.
Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections: Unknown but probably up to 100%

Morocco

Total no. of Botanic Gardens recorded in Morocco: 3.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably up to 10,000.

Approx. no. of taxa (species) in these collections: Unknown but probably 1,000 to 2,000.
Estimated % of pre-CBD collections: Unknown but perhaps 70%

Mozambique

Total no. of Botanic Gardens recorded in Mozambique: 3.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably <1,000
Approx. no. of taxa (species) in these collections: Unknown but probably c.500.
Estimated % of pre-CBD collections: Unknown but perhaps 50%.

Namibia

Total no. of Botanic Gardens recorded in Namibia: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably <1,000
Approx. no. of taxa (species) in these collections: 120.
Estimated % of pre-CBD collections: Unknown but probably about 50%.

Nepal

Total no. of Botanic Gardens recorded in Nepal: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Up to 5,000
Approx. no. of taxa (species) in these collections: 2,300
Estimated % of pre-CBD collections: Unknown but probably c.80%.

Netherlands

Total no. of Botanic Gardens recorded in The Netherlands: 40.
Approx. no. of living plant accessions recorded in these botanic gardens: >100,000.
Approx. no. of taxa (species) in these collections: c.30,000 (15,000 to 20,000 spp.).
Estimated % of pre-CBD collections: 90%

New Zealand

Total no. of Botanic Gardens recorded in New Zealand: 20
Approx. no. of living plant accessions recorded in these botanic gardens: 70,000 to 80,000
Approx. no. of taxa (species) in these collections: 12,000 to 15,000 (c.10,000 spp)
Estimated % of pre-CBD collections: c.90%

Nicaragua

Total no. of Botanic Gardens recorded in Nicaragua: (1, status uncertain)
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown
Approx. no. of taxa (species) in these collections: Unknown
Estimated % of pre-CBD collections: Unknown

Nigeria

Total no. of Botanic Gardens recorded in Nigeria: 16.

Approx. no. of living plant accessions recorded in these botanic gardens: 10,000 to 20,000
Approx. no. of taxa (species) in these collections: <5,000
Estimated % of pre-CBD collections: +95%

North Korea - Democratic People's Republic of Korea.
Total no. of Botanic Gardens recorded in North Korea: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: +3,000.
Approx. no. of taxa (species) in these collections: 3,000
Estimated % of pre-CBD collections: Unknown

Norway
Total no. of Botanic Gardens recorded in Norway: 8.
Approx. no. of living plant accessions recorded in these botanic gardens: Up to 20,000
Approx. no. of taxa (species) in these collections: Up to 10,000 (c.6,000 spp.).
Estimated % of pre-CBD collections: 70% to 80%.

Oman
Total no. of Botanic Gardens recorded in Oman: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown
Approx. no. of taxa (species) in these collections: Unknown
Estimated % of pre-CBD collections: Unknown

Papua New Guinea - P.N.G.
Total no. of Botanic Gardens recorded in Papua New Guinea: 4.
Approx. no. of living plant accessions recorded in these botanic gardens: <10,000
Approx. no. of taxa (species) in these collections: 6,000 to 7,000.
Estimated % of pre-CBD collections: 80%

Pakistan
Total no. of Botanic Gardens recorded in Pakistan: 7.
Approx. no. of living plant accessions recorded in these botanic gardens: Estimated as no more than 5,000
Approx. no. of taxa (species) in these collections: Unknown but probably c.3,000.
Estimated % of pre-CBD collections: Unknown but perhaps +75%.

Palestinian Territories
Total no. of Botanic Gardens recorded in the Palestinian Territories: 2
Approx. no. of living plant accessions recorded in these botanic gardens: <1,000
Approx. no. of taxa (species) in these collections: Unknown but probably c. 300.
Estimated % of pre-CBD collections: 0%

Panama
Total no. of Botanic Gardens recorded in Panama: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.

Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections: Unknown.

Paraguay
Total no. of Botanic Gardens recorded in Paraguay: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.
Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections: Unknown.

Peru
Total no. of Botanic Gardens recorded in Peru: 7.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.
Approx. no. of taxa (species) in these collections: Unknown.
Estimated % of pre-CBD collections: Unknown.

The Philippines
Total no. of Botanic Gardens recorded in the Philippines: 10.
Approx. no. of living plant accessions recorded in these botanic gardens: Up to 20,000
Approx. no. of taxa (species) in these collections: Unknown but probably c.6,000 to 8,000 (-10,000) (representing 4,000 to 5,000 spp.)
Estimated % of pre-CBD collections: Unknown but perhaps 80%.

Poland
Total no. of Botanic Gardens recorded in Poland- 25.
Approx. no. of living plant accessions recorded in these botanic gardens: 60,000 to 70,000.
Approx. no. of taxa (species) in these collections: 10,000 to 15,000 (c.8,000 to 10,000 spp.).
Estimated % of pre-CBD collections: 80% to 90%.

Portugal
Total no. of Botanic Gardens recorded in Portugal: 10.
Approx. no. of living plant accessions recorded in these botanic gardens: 20,000 to 25,000.
Approx. no. of taxa (species) in these collections: 10,000 to 12,000 (8,000 to 9,000 spp.).
Estimated % of pre-CBD collections: 80%.

(Republic of Korea – see South Korea)

Romania
Total no. of Botanic Gardens recorded in Romania: 10.
Approx. no. of living plant accessions recorded in these botanic gardens: c.50,000
Approx. no. of taxa (species) in these collections: c.12,000 (probably 5,000 to 8,000 spp.).
Estimated % of pre-CBD collections: 80%.

Russian Federation

Total no. of Botanic Gardens recorded in the Russian Federation: 102

Approx. no. of living plant accessions recorded in these botanic gardens: conservatively estimated at 180,000 to 200,000.

Approx. no. of taxa (species) in these collections: 40,000 (c.25,000 species).

Estimated % of pre-CBD collections: 90%

Rwanda

Total no. of Botanic Gardens recorded in Rwanda: 2

Approx. no. of living plant accessions recorded in these botanic gardens: Probably c.1,500

Approx. no. of taxa (species) in these collections: Probably less than 500

Estimated % of pre-CBD collections: Probably almost 100%

Saudi Arabia

Total no. of Botanic Gardens recorded in the Kingdom of Saudi Arabia: 1 (and 2 new projects).

Approx. no. of living plant accessions recorded in these botanic gardens: 2,000

Approx. no. of taxa (species) in these collections: c.300

Estimated % of pre-CBD collections: Unknown

Senegal

Total no. of Botanic Gardens recorded in Senegal: 5.

Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably <5,000.

Approx. no. of taxa (species) in these collections:

Unknown but probably c.1,000 to 2,000

Estimated % of pre-CBD collections: Unknown.

Seychelles

Total no. of Botanic Gardens recorded in the Seychelles: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: c5,000

Approx. no. of taxa (species) in these collections: 500 to 800.

Estimated % of pre-CBD collections: Unknown, perhaps 60%.

Sierra Leone

Total no. of Botanic Gardens recorded in Sierra Leone: 2.

Approx. no. of living plant accessions recorded in these botanic gardens: Unknown.

Approx. no. of taxa (species) in these collections:

Unknown.

Singapore

Total no. of Botanic Gardens recorded in Singapore: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably up to 20,000.

Approx. no. of taxa (species) in these collections: 2,700

Estimated % of pre-CBD collections: Unknown but perhaps 70%

Slovakia

Total number of Botanic Gardens recorded in Slovakia: 8.

Approx. no. of living plant accessions recorded in these botanic gardens: 20,000 to 30,000.

Approx. no. of taxa (species) in these collections: 16,000 to 18,000 (probably c.10,000 spp.).

Estimated percentage of pre-CBD collections: 80% to 90%.

Slovenia

Total no. of Botanic Gardens recorded in Slovenia: 6.

Approx. no. of living plant accessions recorded in these botanic gardens: 10,000 to 12,000

Approx. no. of taxa (species) in these collections: c.6,000 (c.4,000 spp).

Estimated % of pre-CBD collections: 90%

Solomon Islands

Total no. of Botanic Gardens recorded in the Solomon Islands: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: < 500.

Approx. no. of taxa (species) in these collections: 150

Estimated % of pre-CBD collections: Unknown

South Africa

Total no. of Botanic Gardens recorded in South Africa: 19.

Approx. no. of living plant accessions recorded in these botanic gardens: Probably 60,000 to 70,000.

Approx. no. of taxa (species) in these collections: 10,000 to 15,000 (8,000 to 10,000 spp.).

Estimated % of pre-CBD collections: Probably 70% to 80%.

South Korea (Republic of Korea)

Total no. of Botanic Gardens recorded in South Korea: 11 (plus several other significant garden collections).

Approx. no. of living plant accessions recorded in these botanic gardens: c.25,000

Approx. no. of taxa (species) in these collections: 10,000 (5,000 spp.)

Estimated % of pre-CBD collections: 90%

Spain

Total no. of Botanic Gardens recorded in Spain: 15 (+ 12 local botanic gardens or recently established projects)

Approx. no. of living plant accessions recorded in these botanic gardens: c.50,000

Approx. no. of taxa (species) in these collections: c. 15,000 (8,000 to 10,000 spp.)

Estimated % of pre-CBD collections: 90%

Sri Lanka

Total no. of Botanic Gardens recorded in Sri Lanka: 6.

Approx. no. of living plant accessions recorded in these botanic gardens: Up to 10,000

Approx. no. of taxa (species) in these collections: c.5,000

Estimated % of pre-CBD collections: 90%

St Kitts-Nevis

Total no. of Botanic Gardens recorded in St Kitts and Nevis: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: Unknown

Approx. no. of taxa (species) in these collections: Unknown

Estimated % of pre-CBD collections: Unknown

St Vincent and the Grenadines

Total no. of Botanic Gardens recorded in St Vincent and the Grenadines: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: c.1,000

Approx. no. of taxa (species) in these collections: 400 (300 spp.)

Estimated % of pre-CBD collections: 95%

Sudan

Total no. of Botanic Gardens recorded in Sudan: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: c.200

Approx. no. of taxa (species) in these collections: 150

Estimated % of pre-CBD collections: 95%

Suriname

Total no. of Botanic Gardens recorded in Suriname: 1 (+ 1 project)

Approx. no. of living plant accessions recorded in these botanic gardens: <500

Approx. no. of taxa (species) in these collections: 200

Estimated % of pre-CBD collections: +95%

Swaziland

Total no. of Botanic Gardens recorded in Suriname: 1.

Approx. no. of living plant accessions recorded in these botanic gardens: Unknown

Approx. no. of taxa (species) in these collections: Unknown

Estimated % of pre-CBD collections: Unknown but probably 0%

Sweden

Total no. of Botanic Gardens recorded in Sweden: 9.

Approx. no. of living plant accessions recorded in these botanic gardens: c.50,000

Approx. no. of taxa (species) in these collections: c.20,000 (probably c.15,000 spp.)

Estimated % of pre-CBD collections: 80% to 90%

Switzerland

Total no. of Botanic Gardens recorded in Switzerland: 25.

Approx. no. of living plant accessions recorded in these botanic gardens: c.100,000

Approx. no. of taxa (species) in these collections: 20,000 to 25,000 (perhaps 15,000 to 18,000 spp.).

Estimated % of pre-CBD collections: 80% to 90%.

Taiwan

Total no. of Botanic Gardens recorded in Taiwan: 4.

Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but perhaps c.15,000.

Approx. no. of taxa (species) in these collections:

Unknown, but perhaps 5,000 to 10,000.

Estimated % of pre-CBD collections: Unknown.

Tajikistan

Total no. of Botanic Gardens recorded in Tajikistan: 5.

Approx. no. of living plant accessions recorded in these botanic gardens: up to 15,000

Approx. no. of taxa (species) in these collections: c. 7,000 (c. 4,000 spp.)

Estimated % of pre-CBD collections: 90%.

Tanzania

Total no. of Botanic Gardens recorded in Tanzania: 4.

Approx. no. of living plant accessions recorded in these botanic gardens: < 5,000

Approx. no. of taxa (species) in these collections: c. 1,200

Estimated % of pre-CBD collections: Probably +90%

Thailand

Total no. of Botanic Gardens recorded in Thailand: 7 (plus a network of forest arboreta).

Approx. no. of living plant accessions recorded in these botanic gardens: Probably up to 50,000

Approx. no. of taxa (species) in these collections: Unknown, perhaps 15,000

Estimated % of pre-CBD collections: Perhaps 75%

Togo

Total no. of Botanic Gardens recorded in Togo: 1

Approx. no. of living plant accessions recorded in these botanic gardens: c.500

Approx. no. of taxa (species) in these collections: 450

Estimated % of pre-CBD collections: Unknown.

Trinidad and Tobago

Total no. of Botanic Gardens recorded in Trinidad and Tobago: 2.

Approx. no. of living plant accessions recorded in these botanic gardens: Probably c.3,000

Approx. no. of taxa (species) in these collections: c.1,500

Estimated % of pre-CBD collections: c.90%

Tunisia

Total no. of Botanic Gardens recorded in Tunisia: 3.

Approx. no. of living plant accessions recorded in these botanic gardens:

Approx. no. of taxa (species) in these collections: < 1,000.

Estimated % of pre-CBD collections: 70%

Turkey

Total no. of Botanic Gardens recorded in Turkey: 6.

Approx. no. of living plant accessions recorded in these botanic gardens: c.10,000

Approx. no. of taxa (species) in these collections: c.7,000
Estimated % of pre-CBD collections: c.90%

Turkmenistan

Total no. of Botanic Gardens recorded in Turkmenistan: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: <10,000.
Approx. no. of taxa (species) in these collections: 5,000 (c.3,000 spp.)
Estimated % of pre-CBD collections: 80% to 90%.

U.A.E. (United Arab Emirates)

Total no. of Botanic Gardens recorded in the United Arab Emirates: 1 (plus 1 project)
Approx. no. of living plant accessions recorded in these botanic gardens: c.500.
Approx. no. of taxa (species) in these collections: c.300.
Estimated % of pre-CBD collections: 0%

U.K.

Total no. of Botanic Gardens recorded in the United Kingdom: 80 (+ other non-botanic gardens with major ex situ plant collections).
Approx. no. of living plant accessions recorded in these botanic gardens: 600,000 to 700,000.
Approx. no. of taxa (species) in these collections: 70,000 - 80,000 (c.50,000 spp.).
Estimated % of pre-CBD collections: 70% to 80%.

(Anguilla)

Total no. of Botanic Gardens recorded in Anguilla: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: <100
Approx. no. of taxa (species) in these collections: 40
Estimated % of pre-CBD collections: 0%

(Bermuda)

Total no. of Botanic Gardens recorded in Bermuda: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown
Approx. no. of taxa (species) in these collections: Unknown
Estimated % of pre-CBD collections: Perhaps 90%

(British Virgin Islands)

Total no. of Botanic Gardens recorded in the British Virgin Islands: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: 5,000 to 8,000.
Approx. no. of taxa (species) in these collections: 5,000 (c.2,500 spp.)
Estimated % of pre-CBD collections: c.70%.

(Cayman Islands)

Total no. of Botanic Gardens recorded in the Cayman Islands: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: 1,000 to 2,000.
Approx. no. of taxa (species) in these collections: c.500

Estimated % of pre-CBD collections: <10%.

(Gibraltar)

Total no. of Botanic Gardens recorded in Gibraltar: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown
Approx. no. of taxa (species) in these collections: +1,000

(St Helena)

Total no. of Botanic Gardens recorded in St Helena: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown but probably less than 500.
Approx. no. of taxa (species) in these collections: <50
Estimated % of pre-CBD collections: 90%

U.S.A.

Total no. of Botanic Gardens recorded in the United States of America: 296
Approx. no. of living plant accessions recorded in these botanic gardens: 600,000.
Approx. no. of taxa (species) in these collections: 90,000 taxa (c.40,000 spp.)
Estimated % of pre-CBD collections: 70%

(Puerto Rico)

Total no. of Botanic Gardens recorded in Puerto Rico: 4.
Approx. no. of living plant accessions recorded in these botanic gardens: <5,000
Approx. no. of taxa (species) in these collections: Unknown but possibly 2,000 to 3,000.
Estimated % of pre-CBD collections: c.90%.

(U.S. Virgin Islands)

Total no. of Botanic Gardens recorded in the U.S. Virgin Islands: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: 5,000 to 6,000
Approx. no. of taxa (species) in these collections: c.4,000 (c.3,000 spp.).
Estimated % of pre-CBD collections: 80% to 90%.

Uganda

Total no. of Botanic Gardens recorded in Uganda: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: 3,000 to 4,000.
Approx. no. of taxa (species) in these collections: 2,500 (<2,000 spp.)
Estimated % of pre-CBD collections: Unknown but probably 80% to 90%

Ukraine

Total no. of Botanic Gardens recorded in Ukraine: 35.
Approx. no. of living plant accessions recorded in these botanic gardens: 70,000 to 80,000
Approx. no. of taxa (species) in these collections: 10,000 to 12,000 (7,000 to 9,000 spp.)
Estimated % of pre-CBD collections: 80% to 90%.

Uruguay

Total no. of Botanic Gardens recorded in Uruguay: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: c. <1,000.
Approx. no. of taxa (species) in these collections: 500
Estimated % of pre-CBD collections: 90% to 95%.

Uzbekistan

Total no. of Botanic Gardens recorded in Uzbekistan: 4.
Approx. no. of living plant accessions recorded in these botanic gardens: <10,000
Approx. no. of taxa (species) in these collections: c,7,000 (c4,000 spp.)
Estimated % of pre-CBD collections: 90%

Venezuela

Total no. of Botanic Gardens recorded in Venezuela: 10.
Approx. no. of living plant accessions recorded in these botanic gardens: <10,000
Approx. no. of taxa (species) in these collections: Unknown but perhaps 3,000 to 4,000 (+2,000 spp.).
Estimated % of pre-CBD collections: 80% to 90%.

Vietnam

Total no. of Botanic Gardens recorded in Vietnam: 5.
Approx. no. of living plant accessions recorded in these botanic gardens: 2,000 to 3,000
Approx. no. of taxa (species) in these collections: c.1,000 spp.
Estimated % of pre-CBD collections: 50% to 60%.

Western Samoa

Total no. of Botanic Gardens recorded in Western Samoa: 2.
Approx. no. of living plant accessions recorded in these botanic gardens: Unknown, but probably c. 1,000
Approx. no. of taxa (species) in these collections: Unknown but possibly c.500
Estimated % of pre-CBD collections: Unknown.

Yugoslavia (Federal Republic of) - (Serbia and Montenegro)

Total no. of Botanic Gardens recorded in the Federal Republic of Yugoslavia: 5.
Approx. no. of living plant accessions recorded in these botanic gardens: <5,000
Approx. no. of taxa (species) in these collections: Unknown but probably c.3,000 (c.2,000 spp.).

Zambia

Total no. of Botanic Gardens recorded in Zambia: 1.
Approx. no. of living plant accessions recorded in these botanic gardens: <2,000.
Approx. no. of taxa (species) in these collections: 1,000
Estimated % of pre-CBD collections: Unknown.

Zimbabwe

Total no. of Botanic Gardens recorded in Zimbabwe: 4.

Approx. no. of living plant accessions recorded in these botanic gardens: c.5,000

Approx. no. of taxa (species) in these collections: 3,000 to 4,000 (c.2,500 spp.).

Estimated % of pre-CBD collections: 80% to 90%.

16.0 Background to Botanic Gardens Conservation International

Following its establishment in 1987, the IUCN Botanic Gardens Conservation Secretariat (BGCS) began to build its membership of botanic gardens worldwide and develop a programme of activities in support of botanic gardens. In 1989, *The Botanic Gardens Conservation Strategy* was published and the following year BGCS became independent from IUCN, and subsequently known as Botanic Gardens Conservation International (BGCI). BGCI registered as a U.K. charity and received the support of HRH The Prince of Wales as its Royal Patron. Independence helped it to gain a greater measure of self-determination and made it possible for the organisation to receive charitable donations in the U.K. BGCI also receives support from the Royal Botanic Gardens of Kew and Edinburgh as Patron Garden members. In addition to its head office in the U.K. at Kew, BGCI now has national foundations in the U.S.A. and Russia and regional offices in China, Colombia, Indonesia, the Netherlands and Spain.

A primary concern of BGCI has been to provide a means for botanic gardens in all parts of the globe to share information and news about their activities, programmes and any new advances made that benefit conservation and education. Networking and capacity building for botanic gardens has been assisted through BGCI's magazines and the publication of a series of resource books, manuals and policy handbooks on the development of botanic gardens and their roles, on such subjects as plant reintroductions, ex situ conservation, environmental education, education for sustainability, computer software, regional action plans, the Convention of Trade in Endangered Species of Fauna and Flora (CITES) and the Convention on Biological Diversity (CBD).

Although publications provide a valuable means to link botanic gardens, they are no substitute for ensuring that people from botanic gardens can meet regularly to share ideas, agree common priorities and to plan the implementation of collaborative programmes. For this reason, BGCI organises an international botanic gardens conservation congress every three years. Following the first such congress in Las Palmas de Gran Canaria, Spain in 1985, this congress has been held in Réunion Island; Rio de Janeiro, Brazil; Perth, Western Australia; Cape Town, South Africa; and Asheville, U.S.A.

BGCI also holds regular international congresses for botanic gardens on education. Four of these congresses have been held to date, in Utrecht, The Netherlands; Las Palmas de Gran Canaria, Spain; Brooklyn, New York, U.S.A.; and Thiruvananthapuram, India.

The last decade has also seen the establishment or growth of a wide range of national and regional organisations in all parts of the world for, or including, botanic gardens. BGCI has worked to support this development and to provide such organisations with assistance and support and in addition to collaborate closely with these sister networks.

Developing efficient information management systems to document botanic garden collections continues to be a priority. The BGCI databases list over 10 000 rare and endangered species in cultivation in botanic gardens. In 1987, BGCI published the *International Transfer Format for Botanic Garden Plant Records* (ITF) to facilitate the exchange of data on botanic garden plant collections in electronic form. The ITF quickly became a recognised international standard for botanic garden record systems. A second version of the ITF (ITF2) was completed and launched in 1998.

BGCI has developed a unique computer database on the botanic gardens of the world, which lists every known botanic garden, arboretum and many more similar institutions maintaining living plant collections in cultivation, with details of the facilities, collections and work of over 2,000 botanic gardens.