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ICRAF Research Relevant to Agroecological Diversity

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> "Agroforestry is a dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels." (ICRAF, *Building on a solid foundation: achievements, opportunities and impact*, 1998).

ICRAF's agenda is based on five pillars of research and development that bring together activities in five ecoregions and given global coherence and perspective to ICRAF's work. The three research pillars are:

- Policy research leading to the promotion of an enabling policy environment for smallholder farmers
- Domestication of agroforestry trees to diversity and intensify land-use systems
- Soil fertility replenishment with agroforestry practices and other nutrient inputs

Two development pillars are:

- Acceleration of impact on farm by ensuring that research results are translated into messages that reach farmers and are then implemented
- Capacity and institutional strengthening in agroforestry research and development.

ICRAF's activities are implemented in six ecoregions: subhumid plateau of southern Africa; subhumid highlands of eastern and central Africa; semiarid lowlands of West Africa; humid tropics of West Africa; humid tropics of Latin America and humid tropics of Southeast Asia. In addition, ICRAF is the convening centre for the Alternatives to Slash-and-Burn Programme and the African Highlands Initiative.

Much of ICRAF's research is directly or indirectly related to agrobiodiversity. Some key examples are as follows:

1. Analysis of the plant biodiversity and farm-level productivity associated with alternative land use systems in the humid tropics of Southeast Asia (Indonesia, Thailand), Central Africa (Cameroon, Nigeria) and Latin America (Brazil, Peru, Colombia, Mexico). This research is conducted through the Alternatives to Slash-and-Burn Programme (ASB). The ASB links 9 international research centres, over 100 national research institutes, university and NGOs. The ASB above-ground biodiversity group (headed by CIFOR) has developed pioneering methods of measuring the functional diversity of vascular plant species – using plant functional attributes (PFAs). Applications of these methods across the benchmark sites has shown that there is enormous variation in biodiversity of fallow systems – with some systems exhibiting relatively high levels of both functional diversity and species richness. The below-ground biodiversity group (headed by TSBF) also uses functional groups as a level of analysis. One preliminary conclusion was that conversion from tropical forest to other land uses does not result in significant loss of below-ground biodiversity, except in cases of pasture and intensive annual cropping. (from *ICRAF Annual Report, 1998).*

2. Working with farmers to prioritize indigenous trees for domestication. Indigenous knowledge studies show that farmers use and know a wide variety of trees in their forests and woodlands, even if they have no experience with planting the trees on their farms. ICRAF's research on tree domestication taps into that indigenous knowledge to identify species of high priority for domestication. For example in 1998 priority setting surveys were conducted in Malawi, Tanzania, Zimbabwe and Zambia to determine farmers' choice of indigenous trees for domestication. Participatory appraisal tools and structured questionnaires was used in each country to collect information from children, adults, village leaders, fruit vendors and traditional healers. Three species of indigenous fruit trees – *Uapaca kirkiana, Strychnos cocculoides and Parinari curatellifolia* were identified as top priority across the 4 countries. Regional rangewide collections of those species have been undertaken and on-station research on propogation techniques is well advanced. (J.A. Maghembe, A. Simons, F. Kwesiga and M. Rarieya, *Selecting Indigenous Trees for Domestication in southern Africa*, 1998.)
3. Enhancing farmers' indigenous knowledge and techniques through analysis of intra-specific genetic diversity. When a promising species of tree is introduced to farmers there is are dangers that the intra-specific genetic diversity may be too wide or too narrow. ICRAF's molecular genetic analysis of agroforestry trees examines genetic diversity, genetic distance and partitions diversity with and among populations. For example, research on the improved fallow species, *Sesbania sesban,* has shown large genetic differences among populations in East and Southern Africa. These results suggest that there are dangers associated with germplasm movement and suggests optimum strategies for further collection.
4. Management of protected areas and buffer zones. In the Philippines ICRAF works with the Biodiversity Consortium of the Sustainable Agriculture and Natural Resource Management Project, funded by USAID, on the management of watersheds with exceptional conservation value. The whole landscape and lifescape of a watershed is the basis for formulating approaches to conserve biodiversity with the active involvement of the communities living near those habitats. This framework is being currently being applied by ICRAF and a number of partners in the Manupali Watershed in Bukidnon, Philippines. A three-pronged approach is being followed: (1) develop and test the elements of a practical social contract for successful buffer zone management; (2) develop the elements of enhanced agrodiversity in the buffer zone and the adjoining private lands through improved agroforestry systems; and (3) characterize, protect, regenerate and expand the natural biodiversity of the Kitanglad National Park and the buffer zone and incorporate this information into a realistic natural resource management system for the upper watershed (Biodiversity Consortium, Sustainable Agriculture and Natural Resource Management Project *Assembling the Elements for a Realistic Buffer-Zone Resource Management Plan,* 1998).