Improving Rural Livelihoods:

CIAT's Medium-Term Plan 2006-2008

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Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture
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CIAT MEDIUM-TERM PLAN

BACKGROUND:
CIAT STRATEGIC PLAN 2001-2010

CIAT's mission is "To reduce hunger and poverty in the tropics thorough collaborative research that improves agricultural productivity and natural resource management." This mission sees scientific research as a powerful instrument to generate knowledge and technology in the form of international public goods that can reduce poverty and malnutrition. Agriculture is the major means of sustenance of many of the world's poor, and agriculture not only has a great impact on the environment but it is also critically dependent on natural resource management. Collaborative partnerships in research and development are central to any prospect of achieving this mission.

Sustainable rural livelihoods constitute the core of CIAT's vision for the future. Poverty is not merely income, but human development. This vision can not be attained by single or isolated advances: higher crop yields alone are not enough; reduced soil erosion alone is not enough; better understanding of innovation systems alone is not enough. Thus, CIAT's niche in achieving sustainable rural livelihoods consists of generating knowledge and technologies that can ultimately help the poor attain three critical conditions:

- Competitive agriculture
- Agroecosystem health
- Rural innovation

These three conditions are interrelated. Without healthy agroecosystems, competitive agriculture can not long be sustained. Without rural innovation to enhance collective action, natural resources can not be managed to ensure agroecosystem sustainability. Without a competitive agriculture, the rural poor will not easily afford to care for natural resources or have the wherewithal to innovate.

CIAT nourishes five core scientific competencies as its long-term assets for working towards sustainable rural livelihoods. Each core competency is composed of a critical mass of scientists in related disciplines supported by appropriate infrastructure.

- Agrobiodiversity and Genetics: The largest core competency in CIAT contributes to agricultural competitivity and agroecosystem health. Emphasis is first on staple food crops and secondly on new income generating crops.

- Pest and Disease Management: Ecologically sound disease and pest management contributes to improved agricultural competitivity and agroecosystem and human health.

- Soils Ecology: Soil health is an important dimension of agroecosystem health as well as critical to crop productivity and thus agricultural competitiveness.

- Spatial Analysis: The smallest CIAT core competency develops decision support tools, models, and data to provide information for better resource management.

- Socioeconomics: The second largest competency provides methods and analyses of individual and community decision making about agriculture, resource management, and collective action for rural innovation. It also assesses the impact of agricultural research.

CIAT's research program is designed in the context of the Future Harvest Centers of the CGIAR. Genetic resources conservation, characterization and enhancement is a major global public good, and CIAT prioritizes beans, cassava, and tropical forages. Agroecosystems research priority is placed on the commonalities between Latin America hillsides, the mid-altitudes of eastern and southern Africa, and the uplands of Asia. Across these broadly similar environments research focuses on soil health, integrated pest management, and land and watershed management. Global public goods are produced through research on methods and principles of participatory research and rural agroenterprises to link small farmers to market opportunities.

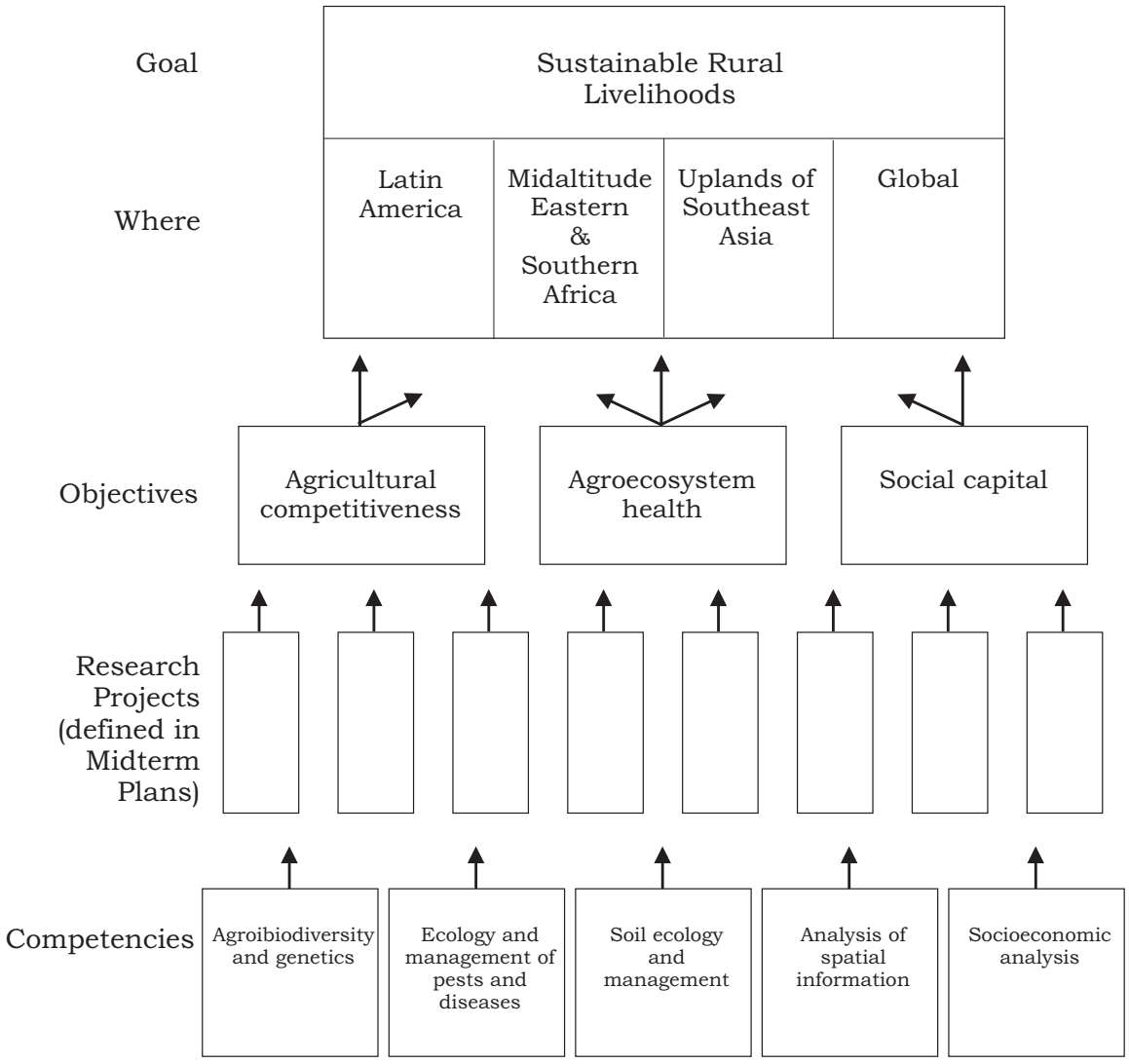
While CIAT's global research outputs are all highly relevant to Latin America and the Caribbean, regionally targeted research is also given priority. This research concentrates on rice and tropical fruits and on resource management in the Amazon basin and the savanna agroecosystem. CIAT's regional strategy for Africa focuses its efforts on beans, cassava, and tropical forages, soil ecology, spatial analysis, pest and disease management, and participatory research and agroenterprises. CIAT's regional strategy for Asia concentrates on forages, cassava, spatial analysis, participatory methods and rural agroenterprises.

In the case of the complex problems of agriculture, poverty, and environmental degradation in the tropics, the needed understanding and technology can only be generated and reach users through research and development partnerships. Moreover, a simple linear model of basic research to technology with different institutions assuming fully distinct roles is no longer appropriate. National agricultural research systems have long been CIAT's most important partners, and remain so. However, support for public agricultural science in low-income countries has weakened. Apart from a few large countries -Brasil, China, India- public agricultural science in the tropics is not generally endowed with sufficient resources. In contrast, the private sector's investment in agricultural research has grown enormously. This research naturally focuses where commercial opportunities are greatest, generally in widely traded commodities, and their interests do not extend to orphan cops without high commercial interest. Nonetheless, private sector developed research methods may be useful and it can sometimes provide a highly efficient technology delivery system reaching even the small farmer.

Civil society organizations including NGOs, often have interests in the issues of poverty and environment quite similar to those of CIAT. These organizations often concentrate on policy advocacy, emergency relief, and community development rather than research. Where opportunities exist, CIAT will proactively seek collaboration. Advanced research institutes, including universities, are often the source of new methods that can be applied to the specific problems of tropical agriculture. Strengthening partnerships with advanced research institutes will be a high priority. Particular mention is made of strategic partnership with CIRAD on rice research and with TSBF on soils (since fully merged with CIAT).

Many partnerships among the Future Harvest Centers are envisaged in the Strategic Plan. These include CIP and IITA in root and tubers research; ILRI on forages related research; the Systemwide Programs on Integrated Pest Management and on Participatory Research and Gender Analysis; work on agroenterprises with CIP, IITA and ICRAF; with IRRI on rice; with CIFOR. ICRAF and IPGRI in the Amazon along with Brasil; the African Highlands Ecoregional Program with ICRAF; with CIFOR, ICRAF, ILRI and IRRI in the uplands of Asia. Finally, CIAT envisaged the Challenge Programs as important new initiatives with which it would engage.

CIAT's organization to implement the strategic plan to attain its goals is shown in Figure 1. Note that the Strategic Plan leaves the definition of its project portfolio to the rolling three year MTPs. The objectives of Agricultural Competitivity, Agroecosystem Health, and Social Capital correspond strongly to its current three Research for Development Challenges as described in more detail below: Agrobiodiversity, Agroecosystem Management and Rural Innovation. Each of these challenges produce outputs relevant to users globally, and in the priority agroecosystems in Latin America, the mid-altitudes of east and southern Africa, and the uplands of Asia, with all the work ultimately contributing to the goal of sustainable rural livelihoods.


Goal
Sustainable Rural Livelihoods
Where
Latin America
Midaltitude Eastern & Southern Africa
Uplands of Southeast Asia
Global
Objectives
Agricultural competitiveness
Agroecosystem health
Social capital
Research Projects (defined in Midterm Plans)
Competencies
Agroibiodiversity and genetics
Ecology and management of pests and diseases
Soil ecology and management
Analysis of spatial information
Socioeconomic analysis

CONTEXT OF MTP 2006-08:
RESEARCH CHALLENGES FOR DEVELOPMENT

MILLENNIUM DEVELOPMENT GOALS & RESEARCH FOR DEVELOPMENT

Over the past several years, the Millennium Development Goals have become the major framework for the activities of the alliance of the CGIAR/Future Harvest Centers. CIAT is fully and deeply committed to the achievement of the MDGs. At the 2004 Annual General Meetings of the CGIAR in Mexico it was widely recognized that the Centers need to move from framework to action by being an explicit partner in the effort to achieve the MDG goals that are central to the work of the Centers: Food Security, Poverty Reduction, Environmental Sustainability, Human (Maternal and Child) Health, and Water. CIAT is focussing its agenda to contribute to these goals.

The *CIAT Strategic Plan for 2001-2010*, as noted in the previous section, describes three broad avenues for helping rural people improve their livelihoods: make small-scale agriculture more competitive, protect agroecosystem health, and stimulate rural innovation. Early in 2003, CIAT's scientific staff went on a 2-day retreat to reflect on how to put this people-centered strategy into practice over the next 7 years. Three issues of global significance were identified to which we can make significant contributions. This was intended as a research-grounding exercise, the establishment of an institutional "compass" to keep CIAT's work relevant to the needs of large numbers of poor people throughout the tropics. These major goals have now become CIAT's three Research for Development Challenges.

- Agrobiodiversity: Enhancing and Sharing the benefits of Agrobiodiversity
- Agroecosytem Management: Improving Management of Agroecosystems in the Tropics
- Rural Innovation: Enhancing Rural Innovation

The choice of these three cardinal points for CIAT's research program furnishes the principal objectives around which research activities can coalesce, consistently with the vision of the 2001-2010 Strategic Plan. The selected topics are major items on the international agenda, the most cogent and agreed-on expression of which is the United Nations' eight Millennium Goals and 18 targets for the coming decade. Work on the three issues will contribute especially to the stated UN targets for reducing hunger and extreme poverty and protecting the environment.

Under each global theme, CIAT researchers have been able to apply their expertise in clearly defined projects and locations across the regions in which we work. The approach has enabled greater integration among CIAT projects and has strengthened the link between the work done at headquarters and that done in the region.

This integrated approach catalyzes CIAT's work towards improving and building the physical, biological, financial, and social capital that enable sustainable rural livelihoods. Combinations of adoptable technologies that are profitable in the short- and long-term will enable farmers to make their farming systems more resilient in the face of change, while improving and protecting the agroecosystems on which they and others depend.

Participatory approaches that engage civil society will not only help meet the needs of the poorest (including women and children) but will also enhance their social capital and thereby their ability to take advantage of new opportunities. Comprehensive understanding of the dynamic biophysical and socioeconomic forces that underlie agroecosystem degradation, combined with participatory R&D, will foster better public and private decisions on investment and management opportunities that restore degraded lands. Building public and private sector capacities to participate effectively in the emerging global economy will lead to sustainable, long-term development.

CIAT's Medium-Term Plan (2005-2007) was structured around these three Research for Development Challenges. This integrated approach has become a platform upon which to frame CIAT's research projects and priorities, an effective basis to articulate with partners, and a clear means to communicate with investors and stakeholders and kindle their interest in funding this work.

The portfolio of projects through which CIAT's 2006-08 Medium Term Plan will be implemented is structured through these three Research Challenges in order to better achieve an overall coherence in CIAT's work. However, the outputs of many projects contribute to more than one of the Research Challenges. For example, while the bean project is classified within the Agrobiodiversity Challenge, its outputs are also central to the Agroecosytem Management Challenge. Note that the Impact and Policy Analysis Project is seen as cutting across the three Research Challenges and is, therefore, not subsumed within any of them.

ENHANCING AND SHARING THE BENEFITS OF AGROBIODIVERSITY

Background: The world agricultural community's plant genetic diversity is currently being threatened. The speed and scale of the decline are frightening. Over the past 150 years, the diversity of crop varieties – the biological capital amassed by farmer breeders during 10 millennia of observation and selective saving of seed and other reproductive materials – has fallen by an estimated 75 percent. The loss is closely tied to human behavior and demands: changes in land use, population growth, the uniformity required by high-input commercial agriculture, and shifting patterns of trade in food commodities due to globalization.

At the same time, the wild relatives of food crops, so vital to future plant breeding and therefore to food security, are also under threat. Habitat destruction, which includes, ironically, forest clearing for crops and livestock, is the central cause. And now climate

change poses fresh dangers to certain populations of both wild and domesticated plants. For example, without direct human intervention, many of South America's wild peanut species will be extinct within 50 years.

The Convention on Biological Diversity was adopted at the United Nations Conference on Environment and Development, the so-called Earth Summit, in Rio de Janeiro in June 1992. Together with Agenda 21, a much broader blueprint for environmental protection, the Convention was a global call-to-arms against burgeoning threats to biodiversity – not just the diversity of agricultural plants but of all life forms.

Since then, two other international instruments, closely linked to the goals and spirit of Agenda 21 and the Convention, have been adopted. The Cartagena Biosafety Protocol, which stems from Article 19 of the Convention, was adopted in 2000 and is now in force. The International Treaty on Plant Genetic Resources for Food and Agriculture, separate from the Convention but in harmony with it, was adopted in 2001 by member States of the UN's Food and Agriculture Organization (FAO). It entered into force on 29 June 2004.

Both the Convention and the Treaty place great emphasis on equitable sharing of the benefits arising from the use of genetic resources. The Treaty, which is specific to agricultural biodiversity, includes an article on the rights of farmers, the main custodians of edible-plant diversity. It also defines a binding multilateral mechanism for fairly distributing several kinds of benefits: information, technology, capacity building, and profits from product commercialization. The Convention is more general on this point but does mention the rights of "indigenous and local communities" and the need for equitable benefit sharing.

Research Focus: The Agrobiodiversity Research for Development Challenge builds upon the conservation of plant genetic resources; makes a major effort in research to improve the germplasm available through partners to rural communities; and contributes to an appropriate policy environment. To progress on this challenge CIAT conserves genetic resources of beans, cassava and tropical forages. CIAT works with national systems to genetically improve beans, cassava, tropical forages for worldwide. In close collaboration with IRRI, CIAT works to improve rice for the American tropics. Increasing efforts are being made in research on tropical fruits with emphasis on strategic research that supports genetic improvement efforts led by NARS. Important aspects of CIAT's Agrobiodiversity research are carried out in collaboration with two CGIAR Challenge Programs: the Harvest Plus CP on biofortification, co-managed by CIAT with IFPRI, that enhances the macronutrient content of food crops, including beans and cassava; and the Generation Challenge Program to exploit advanced science for the utilization of genetic resources.

Genetic Resources and GIS: The swift pace of agrobiodiversity erosion is extremely worrying to genetic resource experts. Fortunately, recent technological advances, especially in biotechnology and geographic information systems (GIS), provide a window of opportunity to reinforce plant

genetic conservation and use programs – and perhaps to save some valuable species from extinction.

Improvements in molecular marker techniques and the advent of DNA-chip technology, for example, allow rapid, accurate screening of large numbers of plant specimens, whether from gene banks or natural habitats, for traits of economic value. This information can be fed back into conservation programs to fine-tune or reorient them. Or it can be channeled into breeding programs to develop cultivars with farmer-friendly traits – such as lower water and soil-nutrient requirements, better pest and disease resistance, and higher concentrations of micronutrients lacking in the diets of poor people.

GIS tools can also make for more effective conservation of plant genetic resources. CIAT's FloraMap, for example, predicts the geographic distribution of wild plants using climate data for the locations (defined by latitude and longitude) where the species have already been collected. By overlaying other georeferenced information, such as road networks, soil patterns, administrative boundaries and population centers, FloraMap can also help identify suitable areas for *in situ* conservation.

Intellectual property rights: IPR scene has changed dramatically in recent years. On the one hand, international agreements explicitly recognize the sovereignty of national governments over the genetic resources within their borders. On the other hand, private firms are increasingly taking advantage of legal means to protect innovations, whether these be patent applications or enforcement of royalty agreements through court action. If international agreements are to foster truly equitable benefit sharing, then CIAT and other centers of the CGIAR must be ready to assist their national partners with PGR-related capacity building

New Directions: A new initiative, "Safe Deployment of Transgenic Plants in the Neotropics", is being developed with partners. The target countries are Mexico, Costa Rica, Colombia, and Brazil. Over the past year, CIAT has worked with five organizations to design an ambitious collaborative project that will help Latin American countries apply the provisions of these seminal international agreements. Latin American members of the project's core planning group are Colombia's Alexander von Humboldt Institute, Costa Rica's National Biodiversity Institute (INBio), and Mexico's National Commission for Understanding and Use of Biodiversity (Conabio). USA-based members are Cornell University and the Smithsonian Institution's National Museum of Natural History.

Another initiative under development is "Conservation and Sustainable Use of Wild Relatives of Crops Through an Integrated Understanding of Functional Diversity". The target regions are the Meso-American and Andean biological corridors. CIAT is partnering in this initiative with CONABIO, Cornell University-Institute of genomic diversity, INBio, the Alexander von Humboldt Institute, and Smithsonian Institution's National Museum of Natural History. This work aims to enable Latin American countries to make wider use of their biodiversity in the context of globalization, to rationalize conservation efforts by supporting policy making with solid technical information, and to

uncover "functional diversity" for enriching gene pools. It will cover staple food crops important to Latin America and other regions, such as maize, American rice, common beans, and cassava. Also included will be a number of fruit and vegetable crops with significant commercial potential, namely cucurbits (gourd family), papaya, annona (custard apple family), cacao, and avocado, plus a few multipurpose native tree species.

Although Central America harbors a unique store of genetic diversity for maize, rice, and beans, it is no longer self-sufficient in any of these staples. A major benefit from enhanced conservation should therefore be greater food security in this region. Yet an even bigger payoff will probably be seen in other producing regions, especially Africa, where these crops are much more widely grown. Fortunately, the "multilateral system" envisaged by the International Treaty on Plant Genetic Resources for Food and Agriculture provides for incentives, financial and otherwise, for countries to operate their agrobiodiversity conservation programs as sources of international rather than merely national public goods.

Since fresh resources are being sought for partners as well as CIAT to make all this work fully possible, it is not currently reflected in the MTP 2006-08 output targets.

IMPROVING MANAGEMENT OF AGROECOSYSTEMS IN THE TROPICS

Background: An agroecosystem is a biologically driven system, managed by humans, for the primary purpose of producing food as well as other socially valuable non-food goods and environmental services. Significant trade-offs often exist between the provision of agricultural and environmental goods from agroecosystems. Increasing or even maintaining agricultural and environmental outputs from agroecosystems (hillsides, forest margins, savannas) in the tropics is a major challenge requiring new technologies, policies and institutional development. Contributions are needed from a range of biological, agricultural, environmental, social, and information sciences, as well as on the local knowledge of farmers and other traditional resource users. Such management strategies must increase agricultural productivity (using input measures that include natural resource consumption as well as labor, capital and purchased inputs), while reducing the risks of significant environmental impact and, where possible, deliver global environmental goods and services.

To meet the food and income needs of the poor, new opportunities of intensification and diversification need to be balanced against their broader consequences and constraints. Intensification will influence the attractiveness of extensive land uses. Community based initiative will restrict activities on forest frontiers. Diversification of agricultural production requires, among others, the development of new market chains that respond to existing and future demands for new products. Costs of intensifying land use should also decrease through the use of improved multiple stress adapted and biofortified germplasm and/or management practices, that can offer farmers more output per unit of input. Both intensification and diversification call for investments in improving management of agroecosystems in the tropics (IMAT) that, in turn, yield benefits of reducing poverty,

increasing the resilience of productive capacity of tropical agroecosystems, and maintaining environmental goods and services.

IMAT is a comprehensive approach to agroecosystem research that addresses the full range of drivers and consequences of agroecosystem degradation — biological, physical, chemical, social, economic and political. IMAT is based on the premise that farmers can choose from a variety of crop and management options and strategies to optimize their production goals; and that society can choose from a range of resource use options to minimize private-public trade-offs. Enhanced knowledge and decision support tools are needed not only on agricultural systems (i.e., on the performance of crops, crop and forage systems and rotations, and associated management practices under a variety of cropping systems, landscapes, and environments) but also on the full chain of interactions from markets and policies to production systems to agroecosystem and human health. Agricultural productivity enhancement and environmental maintenance requires investment in IMAT.

Research Focus: The Improving Management of Agroecosystems in the Tropics Research for Development Challenge contributes technical, institutional, and policy innovations for the improved management of tropical agroecosystems that benefit poor communities and the local and global environment. Within the target agroecosytems (see Target Ecoregions in the Research Challenge narrative for details), this research involves a number of interrelated efforts including the generation of improved germplasm. Pest-and-disease knowledge and management systems are developed with partners for sustainable productivity and a healthier environment. Through the Tropical Soils Biology Fertility Institute, headquartered in Nairobi, Kenya, profitable, socially-beneficial and resilient agricultural production systems are developed based on integrated soil fertility management. Research is conducted on improved watershed management and resource (water) allocation based on knowledge of land-water interactions, production systems and water use. This work is closely aligned with the Food and Water Challenge Program of the CGIAR within which CIAT leads the research theme on upper watersheds management. Finally, CIAT aims to contribute to improving land use systems through research on spatial dynamics at the local, regional and global scales. Many elements of these related research efforts will in 2006 be closely aligned with the Sub-Saharan Africa Challenge Program as it goes into full implementation. It also involves close collaboration with the heartland projects of the other two research challenges of CIAT (sharing the benefits of agrobiodiversity and rural innovation) as well as the impact assessment project of CIAT.

The scope of research for IMAT includes:

Developing options

- Using improved, multiple stress (biotic and abiotic) adapted and biofortified, germplasm as key components of the production systems;
- Diagnosing and prioritizing with partners cost-effective technology and management practices that farmers can adapt and adopt;
- Developing and promoting integrated disease and pest management (IDPM) strategies dealing with pathogen and insect population dynamics; microbial and plant natural products for disease and pest management; pesticide research to develop management alternatives that encourage judicious use of agrochemicals, resulting in healthier plants and farmers;
- Developing and promoting integrated soil fertility management (ISFM) strategy dealing with: intensification and diversification of cropping systems; and managing the genetic resources of soil for enhanced productivity and plant health;
- Fostering community-based watershed management to address local natural resource priorities and contribute to improved environmental management, equitable resource allocation, and enhanced livelihood and food security;
- Identifying biophysical and social niches in the landscape where different IMAT technologies can combat land degradation using spatial information and analysis that is novel, significant and actionable to reduce the risks associated with agricultural development;

Assessing impacts of options

- Understanding farm, community, and political level social dynamics to address sustainable land management challenges that range from plot to landscape scales;
- Integrating plot-farm-watershed and higher level information related to target agroecosystems to improve learning and decision-making;
- Developing and validating a minimum set of social, economic, and biophysical indicators of agroecosystem health;
- Developing local and formal monitoring systems to evaluate the impacts of IMAT options and practices on ecosystem services and facilitate consensus building and collective action processes;

Implementing change processes

- Enhancing organizational capacities that enable farmers to link to markets;
- Evaluating trade-offs / win-win situations between agricultural productivity and ecosystem services and develop and disseminate decision tools for improved IMAT; and
- Strengthening institutional and community capacity to improve agroecosystem management.

By moving from plot to the landscape scale, IMAT addresses tropical agroecosystem management challenges including adaptation to climate change by generating technology,

and institutional and policy innovations that restore degraded agricultural lands, enhance agroecosystem health and improve livelihoods.

RURAL INNOVATION RESEARCH

Background: Economic globalization and other forces of change present rural people with threats as well as new opportunities. Increased competition and volatile markets, combined with degraded production environments, are pushing many people and places deeper into poverty. Others, though, are finding ways to innovate more quickly and effectively, leading to a more competitive and sustainable agriculture.

Much experience has shown that, through properly supported groups and small enterprises, rural people can successfully exploit the opportunities offered by domestic and international markets for a wide variety of tropical products and at the same time improve their management of natural resources. To accomplish this on a large scale requires that rural people build a stronger capacity to acquire, create, use, and share critical information and knowledge. For breaking into new markets, for example, they need up-to-date information about product options, price trends, quality standards, and crop management practices. To act on such information, they must gain the knowledge necessary for producing, processing, and marketing higher value crops through viable rural agroenterprises.

In recent years CIAT and its partners have devised a series of tools, methods, and approaches by which farmer groups, with the aid of local organizations, can accomplish three key tasks:

1. Prepare and implement plans for developing rural agroenterprises in a given territory.
2. Develop, identify, or adapt technologies that are suited to farmers' circumstances and enable them to enhance their food security or competitiveness in markets.
3. Strengthen the knowledge systems and information networks needed to support agroenterprises, with the aid of new information and communication technologies, or ICTs.

Those approaches are not recipes or formulas but rather constitute points of departure for a collaborative learning process through which partners adapt the approaches to local circumstances and enrich them through local experience.

Research focus: Collaborative research at CIAT has given rise to a territorial approach for *agroenterprise development* that features four main components. The first involves the establishment of interest or working groups consisting of community leaders and local development professionals who are committed to agroenterprise development within a territory. In a second stage, group members identify and analyze market opportunities, resulting in a portfolio of high-potential options. Next, they conduct participatory analysis of the production-to-market chains for promising options and, based on the results, design strategies that enable small farmers to establish competitive

advantages and stronger market links. Finally, the interest groups strengthen the local network of business support services, such as credit, information, inputs, and technical assistance. In search of measures that favor agroenterprise development through individual and collective action as well as better access to markets for smallholders, Center scientists are now conducting research that examines various institutional innovations and policy options at the local, national, and international levels to support these processes.

The long-term viability of new agroenterprises depends to a large extent on farmers' ability to learn how to solve problems in production and processing through *participatory* research. This includes a capacity for participatory monitoring and evaluation of the research process, which is vital for enabling farmers to systematize and share their experimental results and express their demands for support services. The experience of CIAT and partner organizations demonstrates that rural people are fully capable of carrying out these tasks and suggests that these approaches offer an effective means of fomenting technical and social innovation in remote rural areas. One reason for the effectiveness of these approaches is that they tend to encourage the fusion of formal science with farmer experimentation, resulting in alternatives that are both technically sound and locally relevant. In addition to devising participatory methodologies, CIAT scientists are conducting research to design with partners institutional mechanisms and policies for promoting the use of such innovations.

Farmers applying the approaches outlined above soon realize the need to enrich and share their learning experiences through stronger links with multiple *information and knowledge* sources. Exciting opportunities to accomplish those ends are being created by the gradual spread of Internet access and other new ICTs into rural areas. To find ways of linking ICT use with rural innovation, CIAT scientists are conducting research to develop various tools and methodologies.

Research conducted by CIAT and its partners has demonstrated, for example, that community telecenters (which provide public access to ICTs and orientation in their use) can help local organizations address multiple challenges, including rural agroenterprise development. That and more recent experience also suggest that the social benefits of community telecenters can be enhanced through local development of Web-based information systems that combine important knowledge from farmers' experience with relevant information obtained from R&D organizations. In support of agroenterprise development, these systems can provide information on such topics as markets, technological options, and availability of support services.

In order for local information systems to be truly relevant and useful, it is important that they be developed in a participatory manner with community-based stakeholder groups, representing farmer associations and other local organizations. CIAT's experience suggests that the establishment and training of such groups is an important means of strengthening local information networks. With support from local organizations, these groups can help build the knowledge their communities need to achieve sustainable

livelihoods, with the aid of new ICTs, in combination with conventional or traditional communications media.

To develop the kinds of outputs described above, CIAT increasingly conducts research through "learning alliances." These are coalitions of R&D organizations, which may include other partners as well, such as policy makers and donors. Together, the partners implement a set of jointly designed development approaches in a territory of mutual interest, with a strong emphasis on capacity building for partners while CIAT plays a role of also conducting strategic research on the effectiveness of alternative approaches. In the process they reflect collectively on what is working and what is not and then put the lessons into practice, leading to new cycles of learning. Our partners thus play an active role both in developing and scaling out new tools, methodologies, and approaches while CIAT's comparative advantage is in research. During recent years learning alliances involving CIAT and various R&D partners have been created in Central America, Eastern Africa, and the Andean Region of South America.

Another path to partnership, one that parallels the learning alliances, involves municipal *rural planning*. In recent years CIAT has developed a participatory approach to this task, together with various information tools designed to support the planning process as well as the monitoring and evaluation of resulting projects and other actions. These tools feature software that facilitates information access, presentation, and sharing as well as powerful geographic information systems (GIS) that permit sharper analysis of key development indicators. Further research is needed on the effectiveness of such tools in different institutional contexts.

Most of this work takes place within the framework of the Center's Rural Innovation Institute but also involves the CGIAR Program on Participatory Research and Gender Analysis, which CIAT coordinates. While reaching out to partners through learning alliances, the Center also "reaches in," promoting the use of participatory plant breeding and other approaches in our Research Challenges as well as in other CGIAR centers.

2004 RESEARCH HIGHLIGHTS

CONSERVATION AND USE OF TROPICAL GENETIC RESOURCES

Study of gene flow in the tropics: The first phase of a 4-year-BMZ funded-project on the assessment of gene flow from crop to wild/weedy relatives in tropical America using bean and rice as models was accomplished. The goal of this project is to generate baseline genetic information for the development of guidelines on the safe introduction and use of novel agriculture traits (biotechnology derived or not native from the place of introduction), while reducing potential environmental impact on native biodiversity in the Neotropics. The model crops selected are important for food security throughout Latin America, Africa and Asia, being basic for the rural and urban poor people.

Results showed that on both crop models (beans and rice) gene flow occurred: i) between the crop and its wild/weedy relatives, ii) the direction from the crop to the wild/weedy relative cannot be ignored (from 0.003% to 0.06%); and iii) introgression because of gene flow is repetitive in space and time (on the bean model; in rice repeated introgression over time needs to be evaluated). The scoring of phenotypic traits alone (i.e. herbicide resistance, anthocyanin color in flower/stem/leaves) to assess gene flow, overestimates the level of hybridization rate. Because of these potential errors, methodologies were optimized to use molecular markers to detect rate and direction of gene flow in bulk DNA allowing the analysis of large field samples. These tools and methodologies will give a better understanding of the gene flow/introgression dynamics in crop/wild/weedy complexes and potential impact on biodiversity. The potential impact of gene flow on the genetic structure of the recipient population still needs to be assessed. To that end we are planning in future studies to use genes that confer a positive advantage against selection also allowed establishing a methodology to detect cases of introgression at small scale in crop/weedy/wild contact zones, and to quantify it with the aid of molecular markers.

Functional Genomic Tools to Study Starch Content and Cassava Bacterial Blight Resistance: Two economically important characters, starch content and bacterial blight resistance, were targeted to generate a large collection of ESTs and Micro array analysis. For ESTs collection, two libraries were constructed from cassava root tissues of varieties with high and low starch contents. Other libraries were constructed from plant tissues challenged by the pathogen Xanthomonas axonopodis pv. manihotis (Xam). We obtained 11,954 cDNA sequences from the 5'ends, including 111 from the 3' ends. Cluster analysis permitted the identification of a unigene set of 5,700 sequences. Sequence analyses permitted the assignment of a putative functional category for 37% of sequences whereas ~16% sequences did not show any significant similarity with other proteins present in the database and therefore can be considered as cassava specific genes.

A cassava cDNA micro array containing the unigene set was constructed and used to study the incompatible interaction between cassava and Xam. A total of 199 genes

were found as differentially expressed (126 up-regulated and 73 down-regulated). A greater proportion of genes differentially expressed was observed at 7 days after inoculation. Expression profiling and cluster analyses indicate that in response to inoculation with Xam, cassava induces several genes, including principally those involved in oxidative burst, protein degradation and pathogenesis-related (PR) genes. In contrast, gene-encoding proteins that are involved in photosynthesis and metabolism were down regulated. In addition, several other gene-encoding proteins with unknown function or showing no similarity to other proteins were also induced. The QRT-PCR experiments allowed to confirm the reliability of our micro array data. In addition we showed that some genes are induced more rapidly in the resistant than in the susceptible cultivar. This is the first large cassava EST resource and unigene micro array developed today and publicly available, thus making a significant contribution to genomic knowledge of cassava.

Genetic Resources: A total of 8,274 accessions were distributed during 2004. This figure is slightly higher as compared to last year, because of important initiatives by CIAT commodity projects (e.g. the Biofortification Project, the Generation Project) and partners. It shows that interest into the Designate Collections maintained by CIAT GRU (57,705 accessions designated to date for the three commodities) continues on the high side, and that it will be highly justified to sign an agreement with the Governing Body of the International Treaty (international law since June 29, 2004). Currently, thanks to the Upgrading Plan funded by the World Bank, CIAT GRU is regenerating 4,083 bean accessions and 4,264 accessions of tropical forages.

BEAN IMPROVEMENT FOR THE TROPICS

High yielding heat tolerant climbing beans: The introduction of mid-altitude climbing beans to Africa has been one of CIAT's most dramatic impact stories, whereby yields of beans were tripled compared to yields of bush beans available at that time. But climbing beans continue to be limited in their extension by their relative heat sensitivity that does not permit planting them at mid-low elevations (below 1200 masl). This year we report on high yielding climbing beans adapted at CIAT headquarters, at an elevation of approximately 1000 masl. A total of 40 advanced $F_{5.7}$ lines were selected for yield testing which had been evaluated with marker-assisted selection using the SCAR marker for bc3 resistance. The local landrace Calima Voluble Darién (itself well-adapted at 1500 masl) yielded only 1009 kg ha^{-1}, while improved lines produced as much as 2746 kg ha^{-1}. Several of these, including the two highest yielding also carry bc-3 resistance to BCMNV. Grain type in these families is of the highly commercial Andean types, making them especially attractive to farmers. In Uganda an improved climbing bean for lower altitudes, MAC 31, has been released already. These heat tolerant climbing beans will be incorporated into the breeding program for improved nutritional value.

IMPROVED CASSAVA FOR THE DEVELOPING WORLD

Research in SE Asia: A new Nippon Foundation-funded cassava project entitled "Improving the Livelihoods of Smallholder Upland Farmers in Lao PDR and Cambodia through Improved and Integrated Cassava-based Cropping and Livestock Systems" started in April, 2004. The new Nippon Foundation (NF) funded cassava project is working in close collaboration with the National Agric. and Forestry Research Institute (NAFRI) and with CIAT's Participatory Research for Development in the Uplands (PRDU) project in Lao PDR, while a similar collaborative arrangement has been established with the Cambodian Agric. Research and Development Institute (CARDI) in Cambodia.

High-Value Cassava: An important change in the direction of the cassava-breeding project at CIAT is rapidly taking place. An increased emphasis will be given to the development of "high-value cassava". In addition to the ongoing activity to increase the nutritional value (pro-vitamin A, Fe and Zn) of cassava roots financed by HarvestPlus, significant progress was achieved in confirming the natural occurrence of higher tan average (> 5%) levels of proteins in cassava roots in the Manihot esculenta gene pool. This finding comes to strengthen the activities already going on to introgress the high-protein trait from wild relatives. Finally a major step has been given to create the conditions for the production, identification and exploitation of cassava germplasm with novel starch types. Several approaches ranging from traditional recurrent selection to the implementation of the TILLING molecular approach for the identification of specific mutations started to be implemented. Resources for the creation of a high-capacity starch quality laboratory have been obtained to analyze as many as 15,000 starch samples per year. The relevance of these strategies is difficult to over-emphasize. In addition to the benefits of a higher nutritional quality in cassava roots for the human populations that depend on this crop, the same traits will also increase the commercial value of the roots when used for animal feed. An increase as large as 30% in the income of farmers is not unreasonable. A similar increase could be expected if cassava roots with an amylose-free (waxy) starch could be developed and identified.

IMPROVED RICE FOR LATIN AMERICA AND THE CARIBBEAN

The International Year of Rice: Rice is the first crop to receive the honor of a United Nation Year. It is because of the importance of this crop throughout the world. In Latin America, there have been conferences and celebrations in support of the International Year of Rice. The principal theme of these events has been to look forward on how to continue to increase the productivity and the stability of rice production. We have discussed how to work together more effectively and share the products of our research. The scientist, extension agents, private companies, and public institutions have all expressed their willingness to develop closer working relationships. In this spirit, we can expect to continue the gains in productivity and to be part of the effort to eliminate hunger and poverty.

Efficient use of water: a challenge for the future: Although Latin America has the greatest amount of water per person, it is still a scarce resource. Nearly two-thirds of the rice cultivated in the region lacks adequate control of water. We have been working on developing rice for favored upland or aerobic environments. The yields of upland rice have significantly increased over the last decade, and in some cases approaches those of irrigated rice. These have been designated as dual-purpose rice, and they do well in irrigated and aerobic environments. Our long experience with aerobic rice has put us in a good position to play a significant role in the Generation Challenge Program. We combine expertise in aerobic rice breeding, the use of molecular tools, and advanced interspecific crosses including the CSSL lines. Many of the wild species have good drought tolerance and are a valuable source of traits. While we may not produce a rice that grows like wheat, we can expect that work with this global challenge program, to produce in a more systematic way rice varieties with high yields that use water more efficiently.

TROPICAL GRASSES AND LEGUMES

Genetic variability exists for nitrification inhibition (NI) in* Brachiaria humidicola*: Significant differences were found among 10 accessions of *B. humidicola* and specific NI activity of root exudates. Several accessions of *B. humidico*la with NI activity that is two to three times higher than the standard cultivar CIAT 679 used for nitrification inhibition experiments at JIRCAS and CIAT were identified. The accession CIAT 26159 was repeatedly tested along with the standard cultivar CIAT 679, and the high NI activity nature of this accession was confirmed by JIRCAS. The existence of substantial differences among accessions of *B. humidicola* in NI activity of root exudates demonstrates the genetic nature of this plant attribute and the possibility of improving further the NI ability in *B. humidicola* through breeding and systematic evaluation of germplasm.

The drought-tolerant* Canavalia brasiliensis *is an excellent green manure option for the dry hillsides of Central America: In farmers fields in hillsides of Central America soil fertility is declining and weeds are becoming a major problem. In order to overcome these limitations we have been working with local farmer organizations to introduce, evaluate and promote the use of legumes as green manures. At the SOL Wibuse site in San Dionisio, Nicaragua, four crop rotation treatments (maize/beans, maize/natural fallow, maize/*Canavalia brasiliensis*, and maize + cowpea/*C. brasiliensis*) were evaluated. Results indicated that after two years of rotation the highest yields were observed in the maize + cowpea / *C. brasiliensis* and maize / *C. brasiliensis* rotation plots. The higher maize yields with *C. brasiliensis* as green manure were associated with the high biomass production and permanent soil cover with green foliage provided by this legume during the entire dry season.

TROPICAL FRUITS

Homologue: Homologue is the result of collaboration over two years between the Tropical Fruits project and Land Use. Homologue arose from the need to search for regions with similar conditions to that found at one target point. The measures of similarity are climate and selected soil characteristics. By building up several analyses of this sort one can construct a "Cloud" of probability showing all the places where a particular crop or variety could be expected to do well, based on a limited set of site experiences.

The Homologue package is a self-contained user-friendly mapping system. The user selects the target site simply by pointing at a map. Homologue calculates the joint probability of finding a climate like the target site and a soil within the specified ranges. Homologue goes beyond the simple homologue mapping by including a function to create the "Cloud". Homologue is now in the final stages of completion and manual writing. It is hoped to be in production before the end of 2004. The current version of homologue can only deal with probabilities of soil types in a given site, rather than the actual soil type. The Rapid Soil and Terrain Analysis (RASTA) methodology is being developed to avoid this weakness in the system.

Participative selection and clonal propagation of elite lines: The Tropical Fruits project continues to emphasize the selection of elite lines already being grown by farmers (rather than comprehensive breeding programs) as a first step to providing farmers with elite germplasm. This approach requires clonal propagation techniques that can be used by rural communities to reproduce relatively clean (disease and pest free) clonal material of species that do not breed true. CIAT is working with two model species to develop these techniques: lulo and sour sop.

In collaboration with Corporation Biotech, techniques were developed for clonal propagation of sour sop using a micro grafting technique. In a project financed by Colciencias and lead by Corporación Biotec the technique is now being modified and used by a commercial nursery to propagate elite materials. Farmers can specify a particular tree they like and have it multiplied by the nursery, or they can purchase varieties that the nursery has on offer.

Lulo is normally planted from true seed collected by farmers in their fields. The result is much variability. In collaboration with CORPOICA clonal propagation techniques are being used to reproduce elite material selected by farmers in two regions of the Cauca in a project financed by the Ministry of Agriculture and Rural Development. Towards the end of 2004 farmers have started planting the selected elite materials to compare them with the material obtained from true seed.

CROP AND AGROECOSYSTEM HEALTH MANAGEMENT

Burrower bug: A highly promising strategy for the integrated control of the burrower bug *Cyrtomenus bergi* has been developed. The combination of the entomophagous fungus *Metarhizium anisopliae* and the systemic insecticide imidacloprid in sub lethal dose caused a mortality of 87%.

Farmer participatory IPM: The participatory farmer research group approach for pest and disease management activities have spread to wider and new areas; these methodologies include farmer meetings, field demonstrations combined with field days and exchange visits, promotional materials, farmer activity reports, village information centers, small seed packets, seed displays and exchanges, visits to farmer groups, radio, etc. and are proving to be very effective tools in getting the message to bean farming communities. Pilot sites are now located in Malawi, Tanzania, Kenya, Uganda, DR Congo and Rwanda. These are approximately 24 "Satellite sites" and the technology is reaching about 19,000 farmers, and it is estimated that more than 45,000 farmers are now aware of the bean IPDM message.

Phytophthora root rot: The combined effect of hot water treatment of stem cuttings, biocontrol agents and selection of stem cuttings on Phytophthora Root Rot (PRR) under field conditions in Quindío, Colombia, increased yield of commercial roots by 4.5 t/ha (42.5%), compared with conventional farmer practices. From plots under farmer agronomic management, 8.5 t/ha of roots with rot was obtained, as against 6.9 t/ha (i.e., 18.8% less) from plots under ecological management. Under traditional farmer management 36.8% of roots suffered from rot, whereas only 26.2% under integrated management based on ecological practices. Extensionists and farmers were trained during an international workshop and field days at different regions in Colombia about strategies and practices to reduce PRR.

***Cassava variety resistant to whitefly*:** In collaboration with NRI in the UK, the whitefly resistant cassava variety MEcu 72 has been successfully evaluated against *Bemisia tabaci*, the vector of African Cassava Mosaic Disease. MEcu 72 was recently introduced into Uganda where it will be included in the NARO cassava breeding program to develop resistance in cassava to *B. tabaci*.

Host-pathogen interactions: Characterization of the genetic structure and virulence diversity of rice, beans, cassava and tropical forage pathogens and insect pests using molecular and conventional tools is allowing pathologists and breeders to identify relevant resistance genes and molecular markers associated with them for developing cultivars with durable resistance to some of the most economically important diseases and pests.

Farmer participatory IPM on plantain and banana: Smallholder farmers in Colombia have been working side by side with international and national agricultural scientists and extension agents for the past 3 years to save their plantain stands from bacterial wilt or moko (*Ralstonia solanacearum*). Among the more promising strategies in the emerging

moko-management are *Tagetes patula* (marigold) extract which is incorporated into the soil, and a compost lixiviate used as biopesticide that does double duty as an organic fertilizer, a liquid, produced inexpensively on- farm by composting plantain rachises discard after harvest. The biopesticide shows significant commercial promise, well beyond its current use by small-scale plantain growers. There are more than 400 compost units built by 250 farmers at Quindío department.

TROPICAL SOIL BIOLOGY AND FERTILITY (TSBF) INSTITUTE

Strengthening soil fertility management research capacity in sub-Saharan Africa: Various efforts were made to further strengthen the research for development capacity of the African Network for Soil Biology and Fertility (AfNet). First of all, a successful 9th AfNet symposium was organized in Yaounde, Cameroon, with over 150 participants from all over sub-Saharan Africa and beyond attending. Several guidelines were adopted that will guide the future research agenda of AfNet and its restructuring. Secondly, two training courses aiming at broadening the research capacity of AfNet members were organized. A first training course on 'Participatory research and scaling up' aimed at fostering social science capacity in AfNet while a second training course on 'DSSAT Version 4: Assessing Crop Production, Nutrient Management, Climatic Risk and Environmental Sustainability with Simulation Models' aimed at strengthening the modeling capacity of AfNet members. Thirdly, funds were secured to broaden the range of network trials implemented in each of the sub-regions in sub-Saharan Africa.

Advances in CSM-BGBD methodology and inventory: This year, significant progress was made in the GEF funded Conservation and Sustainable Management of Below-ground Biodiversity (CSM-BGBD) project in all the participating countries in terms of methodology development and inventory of below-ground organisms. Functional groups of soil organisms, for which the inventory by prescribed standard methods was mandatory, were clearly defined and assigned to all the participating countries. A list of optional functional groups, with all the attendant methods for their inventory, was developed in consultation with the partners. The project also produced its first global brochure and newsletter that were circulated extensively to the project participants, donors and other partners of CIAT and TSBF Institute. Progress was also made in project communication. A total of thirteen mailing lists were prepared in addition to a discussion forum and a database of members for communication amongst the project partners. The mailing lists have made it easy for the project partners to communicate and exchange ideas freely and extensively on any topical issue. A website and prototype database have also been designed and developed.

Developing an integrated approach for Soil Fertility, Pest and Disease Management: Integrated approaches are needed to overcome major problems such as soil degradation and soil pest and diseases to achieve agricultural sustainability and environmental protection in the tropics. The combination of soil fertility and pest & disease management approaches would provide a unique opportunity to exploit synergies allowing a better control of soil fertility/pest & disease limitations to crop productivity

than either approach alone. Use of green manures can have a multi-faceted beneficial effect on crop productivity and are showing the potential to reduce crop losses from soil borne pathogens (root rots) and to improve the activity of native beneficial microorganisms (non-pathogenic nematodes, mycorrhizae and rhizobia). First results indicate that despite the relatively limited time of green manure treatments application of 6 t ha^{-1} of *Calliandra houstoniana* (CIAT-20400) biomass to root-rot infested soil significantly reduced incidence (about 15%) and simultaneously increased yield (about 10%) in root-rot susceptible bean variety (A70) compared to control plots. However, while application of *Tithonia diversifolia* reduced the root–rot incidence by close to 30%, it also resulted in considerable yield reduction. Further studies are in progress to understand the interactions among soil fertility, soil biota (pathogenic and beneficial), and crop yield.

COMMUNITIES AND WATERSHEDS

INTA-CIAT (FUNICA) Project: In Nicaragua, this project is adapting environmental sensitive area assessment (ESA) to local conditions by incorporating a social component (environmentally and socially sensitive areas, ESSA) in a project involving several partners: the Instituto Nacional de Tecnología Agropecuaria (INTA) , the Universidad Nacional Agraria (UNA), CARE International, and CIAT. The project is financed by the Fundación para el Desarrollo Tecnológico Agropecuario y Forestal de Nicaragua (FUNICA). To establish the base line we: (▪) defined a minimum set of 50 indicators (24 priority ones) with participating partners in cultural, biophysical, socioeconomic, soil-water and biodiversity, land use-production, and community management aspects; (▪) established a methodology to compile quantified data with partners and municipalities; (▪) systematized information through the Tool book.

Maps have been produced at a 1:20 000 scale in the pilot sub watersheds to identify the ESSA (existing information in the country is at scales greater than 1:50 000). Thirty-six officials of the institutions in the alliance and local partners have received training.

Rural youth from different countries trained in multiple aspects: The youth leadership component of the C&W research projects has several purposes: first, it is thought of as the basis of research projects aimed at solving problems that are felt by local communities and perceived by youth as posing a threat to their future. By developing youth leadership skills, young leaders become co-researchers, critics, and the link between rural communities and researchers. In this way, youth leadership serves as the initiation of long-lasting relationships between the scientific and the rural communities. Also, youth leadership potentializes the impact and speed of assimilation of new knowledge in natural resource management. Youth involvement in research projects related to resources that offer them a source of income or employment, now or in the future, ensures immediate use of research findings and the willingness of parents to support and encourage research activities in their watersheds. Leadership development gives adolescents a voice in the decision-making processes that affect their lives. The C&W project has trained youth in GIS methods and in technologies for integrated

livestock production systems in El Dovio-Colombia. Youth in El Dovio have received technical training also on bio-intensive gardening and on the transformation of bamboo, and in relation to these, in computing, commercialization of transformed products, and in business and money management

GEOGRAPHICAL INFORMATION AND LAND USE

Development of the crop-niche identification tool Homologue: Homologue is the result of over two years' collaboration between the Tropical Fruit project and Land Use. Homologue is designed to map the world regions homologous to a target point. The measures of similarity are climate and selected soil characteristics. The system is for using in two cases. The Homologue package is a self-contained, user-friendly mapping system. The user selects the target site simply by pointing at a map. At present the climate data are restricted to 10 min pixels, but eventually the user may point directly at a field. The user then selects crop adaptation range. Soil data are entered as ranges of tolerance to one or several soil characteristics. Homologue calculates the joint probability of finding a climate like the target site and a soil within the specified ranges. The user can select which continents to map the homologue probability, and the probability map can be saved as an ESRI shape file for further analysis in other GIS systems. Homologue goes beyond the simple homologue mapping by including a function to create the "cloud." The user can specify a number of probability maps, and Homologue will amalgamate them to form a joint probability map by selecting the maximum probability for each pixel in the set. Foreign probability maps from other systems such as FloraMap can be used without transformation. Homologue is now in final stages of completion and manual writing. It is hoped to be in production by the end of 2004.

High resolution topographic data for the globe--A fundamental source of data for spatial research: Topography is basic to many earth surface processes. It is used in analyses including ecology, hydrology, agriculture, climatology, geology, pedology and geomorphology as a means of both explaining processes and predicting them through modeling. Our capacity to understand and model these processes depends on the quality of the topographic data that are available. For these reasons we have invested in acquiring, processing and analyzing SRTM data, which originate from radar imagery and have been processed by the USGS and NASA to produce very high-resolution digital elevation models (cell size of just 92 m at the equator) covering the entire globe. This resource is now available in a cleaned and processed form, permitting immediate extraction of topography data for any area of the world. Indeed several projects have already started using these data in their research. Additionally we have performed detailed analyses of data quality and assessed their potential utility in ecology, agriculture and hydrology, the results of which are published in a 33-page technical report. The data are being offered free of charge to our partners, and the project has processed over 50 requests for data. By the end of 2004 the data will be available for downloading from servers through an alliance with the ICT/KM CSI project and IWMI. Initiatives are also under way with the WWF to provide global datasets on catchments boundaries, stream networks and hydrologically corrected DEMs; results are expected for 2005.

RURAL INNOVATION INSTITUTE (RII)

The Rural Innovation Institute improves the capacity to innovate of resource poor, rural producers and businesses by increasing the scale and impact of new methods and approaches developed by the Institute's projects and programs to strengthen competitiveness, client-driven experimentation and knowledge sharing. All the work of the Institute is carried out in its projects which are presented in the Medium Term Plan as separate Log Frames: Rural Agro-enterprise Development (RAeD); Participatory Research Methods (IPRA) and Information for Development (InforCom). The Institute also hosts the CGIAR Program on Participatory research and Gender Analysis (PRGA).

The Institute continues to build on the established reputation of some long-standing areas of work such as agro-enterprise development and participatory research. At the same time the Institute is developing novel strategic initiatives including Enabling Rural Innovation in East Africa; the Learning Alliances; a Knowledge Sharing facilitation role in the CGIAR system; e-learning courses; the study of innovation histories, innovation ecologies and the role of social capital, networks and "net chains;" and an initiative to support indigenous peoples' ethnic entrepreneurship. New kinds of partnership are also being developed such as that initiated with secondment of a staff member to the Global Forum on Agricultural Research (GFAR) based in FAO, Rome this year.

A considerable proportion of Rural Innovation-related work is carried out in other CIAT projects. In 2004, RII projects had 190 partnerships or joint publications involving other CIAT projects. Some of this work involves RII staff in new research initiatives, and some of it involves use of methods and approaches developed in collaboration with RII support.

Enabling rural innovation (ERI) in Africa: In Africa, CIAT is testing an integrated approach for demand-driven and market-orientated agricultural research and rural agro-enterprise development. ERI offers a practical framework to link farmer participatory research and market research in a way that empowers farmers to better manage their resources and offers them prospects of an upward spiral out of poverty. ERI uses participatory processes to build the capacities of farmers' groups and rural communities in marginal areas to identify and evaluate market opportunities, develop profitable agroenterprises, intensify production through experimentation, while sustaining the resources upon which their livelihoods depend. The approach emphasizes integrating scientific expertise with farmer knowledge, and strengthening social organization and entrepreneurial organizations through effective partnership between research, development and rural communities. By strengthening human and social capital, ERI encompasses effective and proactive strategies for promoting gender and equity in the access to market opportunities and improved technologies, and in the distribution of benefits and additional incomes.

Preliminary results of action research applying the ERI approach in pilot sites in Malawi, Uganda and Tanzania show that small-scale farmers are not always attracted by higher economic returns. Rather they use a range of economic and non-economic criteria for

selecting their existing crops and livestock for new markets. Evaluation of market opportunities stimulates farmers' experimentation to reduce risks, access new technologies, and improve the productivity and competitiveness of the selected enterprises. Lessons learned suggest that building and sustaining quality partnerships between research and development organizations, government, private agribusiness sector; and building necessary amount of human and social capital over a certain period of time are critical for achieving success in small- scale agroenterprise development. This however, requires that an explicit scaling up strategy be mapped out to link successful community processes to meso- and macro-level market institutions at the national and regional levels.

Gains have been made in building capacity of partners in applying ERI approaches to strengthen their work. These approaches are now being tested and evaluated by partners in learning sites in Malawi, Uganda and Tanzania. Additionally, a significant number of partners have institutionalized these approaches in their institutions; e.g., NARS [National Agriculture Research Organization (NARO), Uganda; Dept. of Agriculture Research Services (DARS), Malawi] and NGOs (Traditional Irrigation Programme, Tanzania; Africa 2000 Network, Uganda; Africare, Uganda; Plan Malawi). Scaling out in Rwanda in a joint project requested by the national program is evidence that ERI is gaining significant recognition.

RURAL AGROENTERPRISE DEVELOPMENT

Updating Agro-enterprise Guides: Due to increasing demand for the agro-enterprise guides, the RAeD team has re-organised and updated the main guides, these include:

- A Guide to territorial characterization and developing partnerships
- A Guide to identifying market opportunities for small-scale producers and processors
- Strategies for improving the competitiveness of market chains for small-scale producers
- Collective marketing for small-scale producers
- A Guide to evaluate and strengthen rural business development services

These Guides will be published at the end of 2004 for use in the learning alliance programs planned for 2005. These guides are also supplemented with other manuals on marketing basics and application of business techniques in rural innovation.

Learning Alliance Going Global: In the past two years, RAeD has been working on a series of initiatives to scale up the use of the Territorial Approach to Enterprise Development, with a range of research and development organizations. CRS has been particularly interested in the RAeD methodology as a means of retooling its current staff profile. CRS staff have the view that their progress in combating poverty is impeded by the lack of "best practice" guides and skills within their agency to analyze markets and

design agricultural business plans to assist their clients in the transition to greater commercialization. CRS's corporate vision is to be a lead agro-enterprise organization in the next decade with the ability to implement development programs designed to enhance market engagement of poor communities in developing countries. Following the success of two pilot learning alliance programs, CRS staff have asked RAeD to develop a global development alliance. This project will build upon existing agro-enterprise programs in Central America and East Africa, and expand the agro-enterprise "learning alliance" approach to new countries in West & Central Africa, South America and South and South East Asia. To date 30 CRS country programs have signed and committed funds to this new initiative. The project aims to have immediate impact on the livelihoods of 36,000 farm families and over 200,000 beneficiaries over a 30-month period. This project will commence with a management-planning meeting at the end of 2004 with the aim of starting in the first quarter of 2005.

Enabling Rural Innovation through enterprise development in Africa: Across 8 sites in 21 communities—spanning Uganda, Tanzania and Malawi—RAeD is part of CIAT's inter-disciplinary "Enabling Rural Innovation in Africa" team. The research group is partnering with local research and service providers to develop and apply methods for building the capacity of farmers to identify enterprise options, generate knowledge and technologies and access information for profitable and sustainable enterprise development.

FARMER PARTICIPATORY RESEARCH

Strengthening Community Learning and Change: Community-driven participatory monitoring and evaluation systems offer new ways for strengthening learning and change at the community level. In this process, local communities are involved in developing project objectives, identifying local indicators to track these changes, collecting and analyzing data to assess progress towards agreed objectives and finally identifying factors that can make their projects succeed or fail. Learning to manage the PM&E process builds social and human capital assets of the rural poor which feeds into direct improvement of their livelihoods through more relevant and timely improvements on their projects and agricultural innovations, but also into a wider impact through improved capacity to make effective demands on service providers.

Although, there are various examples of work that focuses on developing PM&E systems with the involvement of stakeholders, there are limited examples of where these systems are managed and supported by local communities, *for their own purposes*. CIAT is testing and adapting this with various communities and partners in Latin America (Colombia, Bolivia, Honduras and Ecuador) and in Africa (Kenya, Malawi, Uganda, and Tanzania). Preliminary results indicate that there are several critical aspects in establishing these systems:

- Developing a capacity building strategy for PM&E at the community level, is critical.
- Capacity building should include applying diverse tools and methods that can encourage active participation of all members, such as graphics, role plays, stories

from the farmers' daily lives, identifying local vocabulary for the technical terms, and using role-plays.
- Ensuring that indicators are negotiated with communities and that communities focus on collecting information only on those indicators that are relevant, from their perspective.
- The initial stages of establishing PM&E systems at community level requires a strong mentoring and follow-up component from facilitators to strengthen communities and partner capabilities.
- Preliminary results show that the community-driven PM&E systems provide relevant information that communities can use to improve the functioning of their projects,
- Integrating community indicators with project level indicators providing a more holistic view of the project benefits and can strengthen information feedback process between communities and R&D systems.

INFORMATION AND COMMUNICATIONS FOR RURAL COMMUNITIES

Systemwide project on knowledge sharing: In a new effort CIAT and other CGIAR centers embarked on an initiative to foster KM/S within and among Centers and their partners. InforCom obtained a significant competitive grant from the CGIAR to foster a learning-oriented, knowledge-sharing culture in the System that improves its performance in strengthening food security, reducing poverty, and preserving natural resources in developing countries. Success in obtaining this grant is a testimony that InforCom, although still in an early stage of development, has established a definite niche and a reputation for high quality.

After the project's start in April, we hired a senior scientist half time to coordinate the project, and organized a planning workshop (held in June), jointly with the Institutional Learning and Change (ILAC) initiative. Based on workshop outcomes, InforCom embarked on four pilot projects, in collaboration with the Bellanet International Secretariat in Canada, aimed at applying KS techniques to deal with important issues in three CGIAR centers (including CIAT) and the Water and Food Challenge Program. We also joined forces with ILAC in a consultancy on the relationship of human resource policies and procedures in three CGIAR centers to KM/S and ILAC. In addition, we began organizing a training course on facilitation for CGIAR staff and through Bellanet made progress in putting together a toolkit on KM/S techniques.

New project to enhance information networks in Bolivia: InforCom obtained support from the UK's Department for International Development (DFID) for a project in Bolivia, aimed at enhancing the information networks of agricultural supply chains, with the aid of new information and communications technologies (ICTs). The project got under way in April, and we quickly consolidated our alliances with Bolivian partners, took steps to begin strengthening their current information and communications initiatives, hired a local project coordinator, and began characterization of information networks at the community level. Through new projects InforCom is integrating its work more closely with that of other CIAT projects, both within and beyond the Center's Rural

Innovation Institute. For example, our new project in Bolivia is closely linked with CIAT initiatives in that country on participatory research methods. Moreover, the project directly involves Center colleagues working on land use, and it draws heavily on our collaborative work in Colombia with CIAT specialists on rural agroenterprise development**.**

E-learning: This year InforCom demonstrated the potential of computer-supported collaborative learning, or e-learning, as a means of making knowledge and other results of agricultural research more widely available and more relevant to development professionals in rural areas. Ambitious and creative course development with partner organizations and active participation in the planning of a CGIAR initiative called the Global Open Agriculture and Food University (GO-AFU) led to a grant from USAID to develop two courses with the University of Florida, Gainesville in the USA. CIAT's first distance education course was launched in collaboration with Colombia's Universidad Nacional.

PARTICIPATORY RESEARCH AND GENDER ANALYSIS (PRGA) SYSTEMWIDE PROGRAM

Capacity developed for mainstreaming gender analysis and equitable participatory research in selected CG Centers and NARS: Formed strategic partnerships with organizations that enabled the PRGA Program to have a major impact on: integrating gender analysis and participatory research into agricultural and natural-resource management research practice and to enhancing the methods and approaches that help improve the livelihoods of the very poor, particularly rural women.

Evidence of the impact of participatory research and gender analysis methods assessed, and methods developed to permit impact-assessment results to be effectively integrated into research and development decision–making: Developed original impact-assessment frameworks tailored to the particularities of assessing the impact of participatory methods, and develop tools that improve the information resulting from impact assessment in order to facilitate institutional learning and change processes.

IMPACT ASSESSMENT

Sharing the Benefits of Agrobiodiversity*:* As part of the HarvestPlus Challenge Program, CIAT breeders are using existing genetic diversity to breed beans high in iron and zinc, and cassava high in vitamin A to reduce micronutrient malnutrition. To target these efforts to the areas of greatest potential impact, the IA project is working with other HarvestPlus economists and nutritionists to estimate the impact of biofortified varieties of these crops in terms of the number of disability adjusted life years (DALYs) that they would save.

According to the analysis, over 12 thousand DALYs are currently being lost in Nicaragua alone as a consequence of iron-deficiency anemia, mainly due to anemia-related illnesses among women and older children. At current levels of bean consumption and under

realistic assumptions regarding adoption, iron-rich beans could reduce the number of DALYs lost nationally by 20 to 39%. Results of a community survey suggest that bean consumption among the rural poor is several times the national average, which means they would benefit disproportionately if the grain were biofortified. Reaching them will be a challenge, however, since they both produce and purchase the beans they consume. For this reason, targeting the commercial producers may well be the best strategy for reaching subsistence farm families with biofortified beans.

Currently over 270,000 DALYs are lost in Northeast Brazil as a consequence of vitamin A deficiency, 83,000 due to mortality and 186,000 as a result of temporary or permanent disability, mainly to children under the age of five. At a regional level, the study found that cassava consumption per capita was lower than expected, so that biofortified cassava would only reduce the number of DALYs lost by 8% in a best case scenario. While modest, this still represents over 20,000 years of healthy life saved. Further disaggregation of the consumption data by geographic region and by income will identify the high cassava-consuming areas where biofortification efforts should be targeted.

Improving Management of Agroecosystems in the Tropics: Most degraded lands in tropical America are pastures so developing technologies to restore these lands could have a significant impact on land degradation. CIAT's soils and forages projects are working on new technologies to enhance both land productivity and farm profitability. In 2004, CIAT economists conducted several studies of the farm-level costs and benefits associated with recuperation of degraded pastures. A survey of farmers and extensionists in Honduras found that for mildly- and moderately-degraded pastures, the estimated benefits of restoration in terms of the value of increased meat and milk production were nearly double the estimated costs of restoring the land. For severely degraded pastures, the economic losses associated with degradation were higher, however the costs of restoring these pastures were nearly equal to the benefits. This suggests that individual farmers may have little financial incentive to improve severely degraded pastures, a finding that supports the contention of CIAT's Development Challenge on Overcoming Degraded Agroecosystems that public sector R&D efforts should focus on severely degraded areas.

A series of studies on management practices developed by CIAT's soils project to build an arable layer (*capa arable*) on soils of the Colombian eastern plains (*llanos*) showed that crop-pasture rotations with minimum tillage and improved varieties could substantially increase farm income in as little as three years. Sensitivity analysis revealed that the profitability of these systems is more sensitive to changes in the crop component than in the livestock component. Given that the technology is targeted towards ranchers with limited experience in crop production, dissemination efforts should pay careful attention to educating farmers about the risks of incorporating crops and how to minimize them. Interviews with adopting and non-adopting farmers in the target region indicate strong interest in the technology, and identify economic and infrastructure constraints to its further spread.

Enhancing Rural Innovation: There is increasing recognition that innovation results not from the scientific discoveries of a single individual or institution, but rather from the interactions of individuals and institutions within innovation systems. This implies that in order to have impact, CIAT needs to pay attention not only to the quality of its science, but also to the way scientists work, both internally and with partners. A study of CIAT's organizational culture carried out by Impact Assessment and Human Resources revealed that, according to staff perceptions, CIAT is very good at understanding and responding to changes in its external environment, however our internal organization and communication may be limiting staff effectiveness, especially of women and Colombian national staff. As a result of the study, a series of initiatives have been undertaken to improve organization and communication throughout the center.

2004 VARIATIONS FROM OUTPUT TARGETS AND IMPLICATIONS FOR 2006

Although the vast majority of 2004 Output Targets that were selected from the 2004-06 Medium Term Plan milestones and covered in the indicators reported in the 2004 Performance Measurement results to the CGIAR, have been fully achieved, there were a few Output Targets that were partially achieved. The utility of Flemingia macrophylla (shrub legume) as a feed source was not completed in cattle feeding trials during 2004. It is expected that these trials will be completed in 2005. The 18 km MARKSIM climate database for developing a site-specific database was not completed in 2004 due to a shortfall below anticipated restricted funding. Completion of this work remains contingent on obtaining restricted funding for this work. Such funding continues to be sought, but has not yet been fully identified. A field manual on participatory research and gender analysis was only partially completed in 2004. This work continues and it is expected to be completed in 2005. The training of trainers workshop on participatory research and gender analysis has been rescheduled for 2006.

2004 Actual and 2005 Estimate Implications for 2006-08 MTP: No significant strategic modifications have been introduced in the overall MTP strategy, goals and outputs due to 2004 actual results or 2005 estimated results. Of course, various factors, among which perhaps the most important is greater or lesser resource availabilities, can in some cases accelerate of reduce the amount of activity in a certain area. However, these ongoing operational adjustments have not led to strategic repositioning in terms of project goals, objectives, target ecoregions, beneficiaries, intended users, expected outcomes or anticipated impacts, though the timing of these latter may of course be affected. Specific annual output targets will naturally from time to time be influenced in some cases by recent progress. However, for 2006 there are no substantial or significant projected strategic modifications in output targets due to 2004 actual or 2005 expected results**.**

2006 PROGRAM HIGHLIGHT CHANGES

While to a very substantial degree the three Research for Development Challenges that provide the framework for the MTP 2006-08 – Agrobiodiversity, Agroecosystem Management, and Rural Innovation - reflect the critical conditions for sustainable rural livelihoods identified in 2001 in the Strategic Plan 2001-2010 (Competitive Agriculture, Agroecosystems Health and Rural Innovation), the evolution of the MTP 2006-08 has been influenced by the draft Science Council Priorities for the CGIAR as well as further analysis and deliberation internally and with partners.

In keeping with the Science Council emphasis on the centrality of international public goods, and its view of the chain of causation from research outputs to ultimate impact as embodied in the Science Council paper on Performance and Monitoring, the three themes around which CIAT envisages its efforts are now denominated **"Research for Development Challenges"**, to capture what CIAT is actually doing to contribute to ultimate development objectives. The new terminology of "Research Challenge" rather than the previous "Development" Challenge captures better what CIAT's own sphere of action really is, without in anyway disassociating its work from its intended ultimate impact. Further, as discussed in more detail below in the section on 2006, the outputs of some of the projects comprising the Research Challenges have been more closely aligned with the draft Science Council Priorities, in expectation of their proximate adoption by the CGIAR.

The Agroecosystems Management Research Challenge more closely resembles the concept of Agroecosystems Health than the Recovering Degraded Lands Challenge in the 2005-07 MTP. This Research Challenge is discussed in more detail overview of the MTP. While issues of land degradation remain central in this research challenge, this modified framework provides a broader framework to include CIAT's ongoing research on water resources, both in conjunction with the Food and Water Challenge Program and also from CIAT's Communities and Watersheds Project, and also for CIAT's Crop and Agroecosystems Health Management Project.

The Crop and Agroecoystems Health project was formerly known as the Integrated Pest Management project. Although the new title more clearly communicates the nature of the research in the project, the actual outputs of the project remain largely consistent with those in the 2005-07 MTP. This project was formerly classified as part of the Agrobiodiversity Challenge, but given the importance of natural resource management issues in the research of this project, it has been decided to reclassify the project as part of the Agroecosystems Management Research Challenge. Again, these are changes in presentation rather than fundamental changes in research strategy.

A significant change in CIAT's project portfolio for 2006-08 is the deletion of the **Systemwide Soil Water Nutrient Management Program.** A substantial part of CIAT's work along these lines continues within the framework of the Tropical Soil Biology Fertility Institute, and it is intended to strengthen partnerships with the Sub-Saharan Africa Challenge Program and the Food and Water Challenge Program. The decision to

end the SWNM Program was taken by the steering committee of the program in 2003, but ongoing commitments in the program had not yet been fully wrapped up at the time of the publication of the 2005-07 MTP, so the SWNM continued to be displayed in CIAT's project portfolio even as it was being wound down.

The **new strategy developed by TSBFI** for 2005-2010 is aligned with the CIAT's three research for development challenges: 1) Sharing the benefits of agrobiodiversity; 2) Improving management of agroecosystems in the tropics; and 3) Rural innovation: Learning to innovate. TSBF-CIAT's Program goals are: to strengthen national and international capacity for sustainable management of tropical agroecosystems for human well-being, with a particular focus on soil, biodiversity and primary production; to reduce hunger and poverty in the tropics through scientific research leading to new technology and knowledge; and to ensure environmental sustainability through research on the biology and fertility of tropical soils, targeted interventions, building scientific capability and contributions to policy. TSBF-CIAT utilizes a range of approaches to achieve program goals in collaboration with its partners in Africa and LatinAmerica. An important feature of this new strategy is the considerable degree of integration that will be called for between biophysical and socioecomical scientists. This is consistent with the Millennium Development paradigm, which posits that development is accomplished by people and builds on changes in behavior.

The Land Use project's outputs and output targets have been further refined to better align them with the recommendations of the Center Commissioned External Review and the three Reseach for Development Challenges. **The Rural Agroenterprise project** has similarly updated its logframe with the transition to the new Science Council format and in the process has made more explicit a policy dimension to its work on the basis that the policy environment has to be favorable to the formation of rural agroenterprises whose prospects are not be solely a function of local community capacity. Likewise the **Participatory Research project** is focusing more on research with an innovation systems approach which includes institutional innovation for organizations supporting rural communities as well as the historic attention given to participatory research at the community level. Likewise, the **Tropical Forages project** has revised its project goal and purpose as explained in the project description.

The Tropical Fruits project will be the subject of a strategic rethink for 2006. New leadership has been brought into the project, new partnerships are being initiated, and the overall context for this work has changed with the draft Science Council priority on high value crops. Developments with respect to this project will be reported in due course.

2004 COLLABORATION HIGHLIGHTS

CIAT's range of collaborators exceeds two hundred. Some of these are long term strategic relations (e.g. CORPOICA in Colombia; EMBRAPA in Brasil; NARO in Uganda; NAFRI in Lao PDR; with CIRAD and IRRI on rice etc.), while other partnerships are more timebound to the joint commitment to specific outputs and do not necessarily continue beyond their achievement. Resources are of vital importance to partnerships, and many, though by no means all, are explicitly engaged in joint resource mobilization. Thus, there is a wide range of shifting elements in partnerships that is a natural part of the ongoing research program, and which neither can be easily summarized nor do they individually necessarily have institutional strategic significance to be reported here, even when such partnerships make valuable contributions to the achievement of Project goals and outputs. This overview will therefore restrict its scope to a few crucial partnership developments related to CGIAR Programs.

Sub Sahara Africa Challenge Program: CIAT is engaging intensively with the emerging Sub Sahara Africa Challenge Program being convened by FARA. Although the details of the collaboration are still being worked out, CIAT looks forward to a major alliance with the SSA-CP. CIAT is working especially closely with the African Highlands Ecoregional Program in pursuing this partnership in Eastern Africa. At the same time, CIAT is committed to working closely with the other Future Harvest Alliance (FHA) Centers to develop with partners in Africa a joint Medium Term Plan for FHA centers' work in Africa, thereby responding to one of the recommendations of the CGIAR Sub-Saharan Task Forces. CIAT sees the FHA as key mechanism for collaboration globally as well as within Africa, enabling centers to better harmonize and coordinate their research.

Water and Food Challenge Program: With the secondment of a CIAT scientist to the Food and Water Challenge Program's Basin Focal Project, CIAT has further deepened its collaboration with this CP. CIAT continues to provide coordination for research theme 2 on management of upper watershed for the CPWF. In addition, CIAT is lead institution on three of the competitively funded research projects of the CPWF and contributes directly to the implementation of five other projects being led by other organizations. Finally, CIAT will be playing an enhanced role in supporting the impact assessment activities of the CPWF.

Strengthening regional partnerships to facilitate integrated soil fertility management in Latin America: TSBF has been particularly active during this year in supporting partner institutions of the Integrated Management of Soils (MIS) consortium in the development of research and validation proposals. Recent funding from the Water and Food CP will allow NARS from Honduras and Nicaragua to conduct collaborative research with TSBFI-LA on management principles of the Quesungual Agroforestry system and validate the system in hillsides of Nicaragua and Colombia. Masters and PhD students from the region will be trained in new methodologies to quantify nutrient and water dynamics under the system. Additionally, members of the consortium are validating the potential of the NuMaSS expert system to generate recommendation of N and P fertilization in maize-based systems in hillsides of Honduras and Nicaragua. This activity

is being carried out with the financial and technical support of the USAID-CRSP consortium. The International Union of Soil Sciences has nominated one of the members of the MIS consortium as the convener for a mega-symposium on methods to assess soil degradation during the next World Congress of Soil Science in 2006. The TSBFI-LA team played a central role in the success of the Latin American Congress of Soil Science, where one keynote address, five invited talks, thirteen oral presentations and four posters were presented by the team and were well received. As one of the highlights of the Congress, the Latin American Soil science Council, approved at its biannual meeting, the creation of the Latin American network of soil science (LatNet). The network aims at promoting the use of common methodologies across countries and institutions, facilitating information sharing and promoting the development of joint research activities. Members of TSBFI-LA were selected to coordinate the launching of the network and TSBFI will host the website of the network. Another main achievement was the successful completion of a national workshop in Colombia dedicated to the topic of indicators of soil quality and land degradation, where the tools developed by the team were exposed to and adopted by a wide audience. The workshop was sponsored by the Ministry of Agriculture and Rural Development from Colombia and was attended by 80 researchers, academicians, farmers and students from twenty institutions from all over the country. Because of the demand from the region, the team intends to plan a second event more likely to take place in the Central American hillsides and a third one in a different country for the savannas in South America.

Institutional Innovation in Africa: The dominant theme right now in the region's internal research environment is institutional change – largely in response to global trends related to commercialization. Uganda was one of the first NARS to initiate this wave of change; today, most national agricultural research and extension systems (NARES) in Eastern Africa, and an increasing number in Southern and Western Africa, are immersed in revising their priorities so as to support a market orientation by farmers, and in reorganizing for this purpose. Change is often uncomfortable especially for individual scientists, and the NARIs have the disadvantage of doing this within civil services that limit flexibility in staffing. The upside is that financial support is showing signs of improvement for some NARS programs and scientists as they adapt and develop broader and more productive partnerships.

The sub-regional organizations (SROs), and particularly ASARECA in Eastern Africa, promote and facilitate these changes in their national membership. Although this can be a slow process, this in turn provides the SROs with a stronger leadership role in setting regional research agenda for all of us. NGOs continue to be major players in development, a few with their own research agenda and some others interested in drawing in expertise from CIAT and other Centers for addressing complementary areas. An area of particularly rapid evolution is that of farmer organizations, with general increase in numbers of farmer groups, their growth into community based organizations, and membership of broader farmer-representative groupings (such as national farmer federations) that increasingly wish to speak for rural civil society rather than be represented by self-appointed NGOs.

Amazon Initiative: In the last 30 years, over 70 million hectares of the Amazon rainforest have been cleared, principally for unsustainable development. Degraded land, most of which is under pastures, occurs in more than 30 million hectares of the region. The Amazon Initiative, a consortium of major research and development institutions, has been formed to help to prevent, reduce, and reverse land degradation by promoting policies and technologies for sustainable land management in the region.

Various institutional and policy barriers constrain the adoption of sustainable land use systems. Some government programs may be sound but are often ineffective due to institutional weaknesses, low levels of participation by land users, poor governance and limited communication of information. Institutions of the Amazonian countries rarely have the opportunity to share research and policy experience. This often leads to duplicated and sometimes conflicting efforts.

Contrasting with the above trends, and in tune with the framework of activities of the Amazon Cooperation Treaty Organization (OTCA), an international, multidisciplinary initiative has been launched to help prevent, reduce and reverse environmental degradation and improve livelihoods of the rural poor in the Amazon.

The Amazon Initiative (AI) Consortium for Conservation and Sustainable Use of Natural Resources aims to design and implement collaborative programs in the region. Founding members of the AI (six National Agriculture Research Systems, four centers of the Consultative Group on International Agriculture Research--CGIAR, and Instituto Interamericano de Cooperación para la Agricultura--IICA, through the Procitropicos Program) signed in October 2004 the Cooperation Agreement that formalizes the Consortium. Founding members of the AI can approve the ingress of other institutions as associate members of the Consortium. In May 2005, the AI Steering Committee approved the ingress of four Associate Institutions.

AI Founding Institutions
EMBRAPA - Empresa Brasilieira de Pesquisa Agropecuária, Brazil
CORPOICA - Corporación Colombiana de Investigación Agropecuaria, Colombia
INIEA - Instituto Nacional de Investigación y Extensión Agraria, Peru
INIAP - Instituto Nacional Autónomo de Investigaciones Agropecuarias, Ecuador
INIA - Instituto Nacional de Investigaciones Agrícolas, Venezuela
MACA - Ministerio de Asuntos Campesinos y Agropecuarios, Bolivia
CIAT - International Center for Tropical Agriculture
CIFOR - Center for International Forestry Research
IPGRI - International Plant Genetic Resources Institute
ICRAF - World Agroforestry Centre
IICA - Instituto Interamericano de Cooperación para la Agricultura

AI Associate Institutions
CIAT, Bolivia - Centro de Investigación Agrícola Tropical
Fundación Trópico Húmedo, Bolivia

IIAP - Instituto de Investigaciones de la Amazonia Peruana, Perú.
UNAMAZ - Asociación de Universidades Amazónicas, Regional.

Action guidelines for the AI include a problem-oriented, participative methodology, and an interdisciplinary approach. The AI will enable better understanding of the interfaces between resource degradation and poverty, and provide the basis for realistic policies to promote sustainable land use. Work groups will be formed within the AI to prepare and carry out research and development intervention activities. The AI process will thus facilitate the formation and operation of a network of researchers from local, national and international institutions. The thematic agenda for AI's intervention priorities focuses on sustainable land use systems to reduce and revert land degradation in the Amazon:

Collaboration in Asia: The current work of CIAT in Asia is in Cambodia, China, East Timor, Indonesia, Lao PDR, Philippines, Thailand, and Vietnam, with some associated activities, through PRGA, in Bhutan, India, and Nepal. An interesting challenge is evident in the fact that the eight major countries in which CIAT is active in Asia use eight different national languages (as well as a multitude of minor languages) and six different scripts.

After nearly 20 years of projects in Asia on cassava and forages, the development of a Regional Office, in 2001, and the increase in the number of projects have resulted in a much broader and more integrated set of activities in the region. Starting about ten years ago, the reasonably narrow species/variety focus on cassava and forages began to broaden into a systems approach with greatly increased participation of farming communities in the evaluation and adaptation of improved technologies. This evolution has continued into activities in research for development aimed at rural innovation with significant impacts on livelihoods. These impacts, which are receiving increasing attention from governments, donors, and other development partners, are increasing as the project cycles mature. Currently, impacts on livelihoods that result from changes in the area of livestock systems are being documented in the next CIAT in Asia Research for Development (CARD) series of booklets.

The major Project areas in Asia are in Cassava, Forages, Rural Innovations, most specifically Rural Agroenterprise Development and Communities and Watersheds, and Land Use. In 2004 we have seen eight continuing projects, four new projects, and the end of one project. In addition, there are six projects with which CIAT in Asia has some linkages. These range from projects receiving technical support from CIAT, projects that provided in-kind support to CIAT, and projects that provide some limited funds to CIAT projects, and a mixture of all three. There are a further three projects that should start in 2005, as well as other possibilities with differing chances of success. The current suite of donors includes AusAID, ACIAR, ADB, IFAD, JIRCAS, MAFF-Japan, the Nippon Foundation, and SDC, with a new initiative to be funded by Austria.

A number of concrete avenues of collaboration in 2004 are highlighted below:

- Maintaining project activities in cassava, with two new projects in Laos, Cambodia, Indonesia, and East Timor, to replace the completed Nippon Foundation project in Thailand, Vietnam, and China, and the recruitment of a Regional Research Fellow to be mentored by Reinhardt Howeler.
- Consolidation of the forages and livestock activities, including expansion of the technology strategies and methodologies ─with the emergence of major economic and institutional impacts.
- A first major foray into the commercial/consulting world through a project with ADB to design a loan project on livestock in Lao.
- Formation of the CIAT-ILRI Association, with the initial incentive being the joint implementation of the ADB loan proposal project, but with active discussions on other opportunities.
- Consolidation of the projects started in 2003, in particular the IFAD-funded support project (PRDU) and the SDC-funded agroenterprise project (SADU). In both cases, the donors have mentioned the possibility or likelihood of continuation for a second phase.
- Further developments in spatial analysis through the remote sensing scientist seconded from JIRCAS, the support funds she has attracted from the Japanese Ministry of Agriculture, Forestry, and Fisheries, and inputs from the Land Use group in Cali, leading to a new project that should start in early 2005.
- Further integration of the activities of projects such that there is greater sharing of expertise between projects.
- Development of possibilities for a fruit project in Asia, which may result in a project in the next two years.
- Maintenance of relations with regional donors to achieve a balance of development projects, with a focus on impacts, and projects with a research for development focus.
- Expansion of the CARD series of booklets in regional languages, with completion of publication of the third booklet, publication of all three booklets into Khmer, and translation of all three booklets into Burmese, ready for publication when a donor can be found.
- Launching of the CIAT in Asia website through excellent collaboration with the Communications Unit in Cali.

CLAYUCA:Latin American & Caribbean Consortium for Cassava Research:
Cassava-based agroindustrial projects led by CLAYUCA's stakeholders, in nine regions of Colombia, are in the implementation phase with direct technical assistance from CLAYUCA. The first cropping season has been completed in some of these projects with promising results (yields above 25 ton /ha have been obtained in some regions). Technological packages are being refined and the critical mass of technical personnel and farmers with improved knowledge and information about modern technologies for cassava production, with emphasis on crop and soil management, has been increased substantially during 2004.

CLAYUCA has completed the development and adaptation of technological packages for the production of high-quality refined cassava flour that can be used for bakery products and industries, and also for the production of other products for human consumption such as croquettes. These technologies have a great potential to help farmers increase their

incomes and employment opportunities through the establishment of linkages with alternative markets. In the case of the bakery industries, for example, it has been possible to prepare different types of bread, with excellent quality, using levels of up to 15% of refined cassava flour as a direct substitute for wheat flour, without major differences or changes in flavor, texture or quality characteristics of the bread. This technology could be very important for countries like Colombia that are net importers of wheat.

Participation of stakeholders in Mexico, Nicaragua, Peru, Venezuela and Colombia, in activities of the Consortium, has been consolidated and strengthened during 2004. A Nigerian cassava starch factory became member of CLAYUCA. Technical personnel from the Consortium are giving direct technical assistance to this stakeholder in Nigeria. Membership of CLAYUCA in Colombia, with stakeholders from the public and private sector has been maintained steady. Some new members have arrived and some old members have left.

The Latin American Fund for Irrigated Rice (FLAR): The Latin American Fund for Irrigated Rice (FLAR) completed ten years of existence. In 2004 the eight current partners signed a joint document at CIAT renewing their commitments and launched a coordinated plan to attract new members. CIAT is a member of this research consortium which is financed by contributions from participating countries. During the past year, the first three varieties ever released from FLAR crosses were launched in Venezuela (1) and Bolivia (2).

Rural Innovation Institute Learning Alliances: Rural Innovation Institute projects report 205 active partnerships in 2003-4, many of which are clustered into learning alliances that are a very significant aspect of how RII does its work. A Learning Alliance is an agreement between a research partner and development partners (including donors and the private sector) to carry out a joint process of action-research on a development-oriented intervention or program that is using some RII methods, tools and approaches. Learning Alliances provide RII projects with proof of concept on a large scale through engagement in fieldwork that advances both the program objectives of development partners as well as the uptake, scaling out and impact of RII research products.

The Learning Alliance concept is itself experiencing rapid uptake within and outside the RII. CIAT first experimented with this approach in 2000 with CARE in Nicaragua. From there the idea moved to East Africa where a six-nation Learning Alliance was set up with Catholic Relief Services (CRS). New Alliances facilitated by agro-enterprise development objectives have since been established in Central America and the Andean region. Within RII the concept of a Learning Alliance has begun to catalyze closer project integration. A new learning Alliance is being sought around the theme of ethnic entrepreneurship.

FINANCIAL HIGHLIGHTS

FINANCIAL OUTCOMES FOR 2004

OVERALL INCOME AND EXPENDITURES

As planned in 2003 CIAT fund raising in 2004 was the most successful year in terms of funding. Compared with 2003 figures, total revenue increased by 13%, from US$32.7 million in 2003 to $37.0 million in 2004. Total expenditures also increased 12% from US$32.6 million in 2003 to US$36.4 million in 2004; ending the 2004 year with a surplus of US$0.5 million, compared with US$0.07 million in 2003, increasing the undesignated net assets to $5.04 million. Main changes in revenue and expenditures are due to the additional restricted project implementation during 2004.

The top three donors in 2004 were USAID, Canada and Switzerland, compared with USAID, the World Bank and Canada in 2003.

Compared with the estimates reported in the MTP submitted in July 2004, actual revenue was 1% higher than projected for 2004, from $36.5 million to $37.0 million, and expenditures were also 1% higher than estimated, from US$36.0 million to US$36.4 million. The increases in both revenue and expenditures projections were caused by a slightly higher rate in implementing restricted projects. The overall result of US$0.5 million was the same amount as projected in July 2004.

PROGRAM EXPENDITURES

Projects expenditures: Compared with the estimated for 2004 in July 2004, two projects had small increases by additional implementation of restricted funding: SB-2 Conservation and Use or Tropical Genetic Resources, up US$0.75 million, mainly due to the new activities of the CIDA Biofortification project, which is a Linkage Project of the Harvest Plus Challenge Program, and IP-1 Bean Improvement for the Tropics, up US$0.5 million. On the other hand, two projects had small decreases due to the lower implementation of restricted funding than previously estimated: PE-3 Communities and Watersheds, down US$0.4 million and CP-1 Harvest Plus Challenge Program, down US$0.4 million.

Expenditures by outputs: There were a few changes compared with the actual 2003 distribution. Sustainable Production was 32 percent of expenditures (34 percent in 2003), Germplasm Improvement 32 percent (31 percent in 2003), Germplasm Collection 16 percent (15 percent in 2003), Enhancing NARS 16 percent (15 percent in 2003), and Policy 4 percent (5 percent in 2003). These variations reflect small differences in the patterns of donor funding and do not represent strategic shifts.

Expenditures by region: From the regional perspective, expenditures in Latin America and the Caribbean decreased from 48 percent to 47 percent. Expenditures in Sub-Saharan

increased from 36 percent in 2003 to 37 percent. Expenditures in Asia and Central and West Asia and North Africa remained stable at 15 and 1 percent respectively.

Expenditures by object: Personnel costs decreased from 53 percent in 2003 to 51 percent in 2004. Supplies and services decreased from 26 percent in 2003 to 24 percent in 2004. Travel expenditures increased from 8 percent to 9 percent and the depreciation cost remained in 4 percent. The Collaboration/Partnership Cost category was included by the CGIAR to show the expenditures implemented by Centers partners. This represented 12 percent in 2004 compared with 9 percent in 2003. The personnel costs in absolute terms increased 7 percent from US$17.4 million in 2003 to US$18.6 million in 2004, mainly due to the revaluation of the Colombian peso against the US dollar during 2003-2004.

FINANCIAL INDICATORS

Short-term solvency (liquidity). The computation of this indicator is current assets plus long term investment minus current liabilities, divided by daily operating expenses excluding depreciation**.** This indicator expressed as expenditures requirements in days, increased from 75 days in 2003 to 77 days in 2004. The CGIAR target for this indicator is a range between 90 and 120 days.

Long-term financial stability (adequacy of reserves). This is computed as unrestricted net assets less net fixed assets divided by daily operating expenses excluding depreciation. Expressed as CIAT expenditures requirements in days, this indicator also increased from 58 days in 2003 to 63 days in 2004. The CGIAR target is a 75 – 90 days range.

Despite improvement in the last two years in both liquidity and reserves indicators, CIAT still is below the CGIAR target. The Management Team has planned annual surpluses of US$0,5 million with the purpose of progressively improving these indicators over a period of 3 years ending in 2007 to fulfill the CGIAR target.

FINANCIAL DEVELOPMENTS IN 2005

Revenue, expenditures and surplus estimates for 2005 in July 2004 in the last MTP submission, maintain stable at the level of: revenue US$37.5 million, expenditures US$37.0 million and surplus of US$0.5 million. This expected surplus will allow to CIAT improve the undesignated net assets to $5.54 million.

Compared with 2004 figures the unrestricted funding will decrease 7 percent, mainly because the Colombian Government has not confirmed its 2005 contribution, the World Bank has not made official the total unrestricted contribution waiting for the result of the performance indicators, and Switzerland reduced 23 percent the unrestricted contribution. These unrestricted reductions are partially compensated with increases from Australia and Belgium. Total unrestricted funding was US$15.2 million in 2004 and is projected at the level of US$14.1 in 2005.

Restricted funding is planned to increase 4 percent in 2005 compared with 2004, passing from US$24.2 million in 2004 to US$25.2 million in 2005.

Canada, USAID and Switzerland remain as the top three CIAT donors for 2005.

PROGRAM EXPENDITURES 2005

Program expenditures: The Soil, Water and Nutrient Management Systemwide program has been incorporated into the PE-2 TSBF Project, leaving a total of 16 projects, which are part of the 3 CIAT development challenges. Compared with 2004 three projects: SB-2: Conservation and Use of Tropical Genetic Resources, BP-1: Impact Assesstment and CP-1: Harvest Plus Global Challenge Program have considerably increased their activities with restricted funding. SB-2 increases with the CIDA Biofortification Linkage project, BP-1 increases with Water and Food Challenge Program activities and CP-1 increases with the full implementation of the program. PE-2 TSBF / Overcoming Soil Degradation decreases by the lower estimated funding level of restricted donors.

Expenditures by Outputs: In terms of outputs compared with the 2004 figures, Sustainable Production decreases from 32 percent in 2004 to 30 percent in 2005. Germplasm Improvement increases from 32 percent to 33 percent. Policy increases from 4 percent to 5 percent and Germplasm Collection and Enhancing NARS remain stable at 16 percent.

Expenditures by region: Compared with 2004 expenditures in Latin America and the Caribbean increases from 47 percent to 48 percent in 2005. Sub-Saharan decreases from 37 percent in 2004 to 36 percent. Expenditures in Asia and Central and West Asia and North Africa (CWANA) remain constant at 15 and 1 percent respectively.

Expenditures by object: Overall personnel remains at 51 percent for 2005, Supplies and services decrease from 24 percent in 2004 to 21 percent. Collaboration/Partnerships Costs increase from 12 percent to 15 percent and Travel expenditures and depreciation costs maintain constant at 9 and 4 percent.

FINANCIAL PROJECTIONS FOR 2006—2008

As with previous submissions, the MTP projection for the following 3 years is extrapolated on the basis of the current year.

Revenue for 2006-2008 is projected to be $37.5 million, as same amount in 2005. Expenditures are projected to be US$37 million, with estimated annual surpluses of US$0.5 million. Unrestricted funding is projected to decrease US$0.9 million in 2006, 8 percent compared with 2005 and 10 percent compared with 2004. Restricted funding is projected to increase US$0.8 million, 3 percent compared with 2005 and 8 percent compared with 2004. Decrease in unrestricted funding is planned to be compensated with

decrease in unrestricted expenditures and additional cost recovery from the restricted projects.

Investment by CGIAR Output, Regions and Object of Expenditures are planned at the same level as 2005.

Project Descriptions and

Log Frames for 2006-2008

CIAT Research for Development Challenge I. Enhancing and Sharing the Benefits of Agrobiodiversity

Project Description

Goal: to contribute to diminishing the risk of genetic collapse of crops and to providing biological options for poverty alleviation by producing, preserving and disseminating germplasm of high nutritional quality and specifically adapted to biotic and abiotic stresses in the tropics.

Objective: To contribute to the conservation of agrobiodiversity in tropical countries and to the sustainable increase of crop productivity and nutritional quality of mandated crops and other high value crops.

Important Assumptions: Pro-active participation of CIAT and NARS agricultural scientists and biologists. CIAT adheres to the International Treaty on Plant Genetic Resources for Food and Agriculture.

Target Ecoregion: Worldwide service, but special focus in developing countries of Latin America, sub Saharan Africa, and South and South East Asia.

Beneficiaries and End Users: Small farmers of Latin America, sub-Saharan Africa, and Southeast Asia will use dozens of germplasm accessions conserved by the genebank, as such or after improvement through biotechnology tools and breeding methods including biotech advances.

Collaborators: IARCs (IPGRI through the Systemwide Genetic Resources Program), CIP, and IITA through root and tuber crop research, IFPRI, IRRI, CIMMYT, IITA, CIP through HarvestPlus and Generation Challenge programs; NARS (CORPOICA, ICA, EMBRAPA, IDEA, INIA, INIFAP, UCR, INIAs, Fedearroz); Farmers and producer associations (FLAR, CLAYUCA); AROs (USDA-ARS, IRD, CIRAD, Danforth Center, CAMBIA, NCGR, and universities—Cornell, Yale, Clemson, Kansas State, Bath, Hannover, Reading, Rutgers, Ghent, Gembloux; biodiversity institutions (A von Humboldt, INBIO, SINCHI, Smithsonian); plant genetic resources networks in the western hemisphere; corporations and private organizations.

CIAT RESEARCH FOR DEVELOPMENT CHALLENGE I. – ENHANCING AND SHARING THE BENEFITS OF AGROBIODIVERSITY (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1 **Genetic Resources And Biotechnology**	To conserve the genetic diversity and ensure that characterized agrobiodiversity, improved crop genetic stocks, and modern molecular and cellular methods and tools are used by CIAT and NARS scientists for improving, using, and conserving crop genetic resources.	Small farmers of Latin America, Sub-Saharan Africa, and Southeast Asia will use dozens of germplasm accessions conserved by the gene bank, as such or after improvement through biotechnology tools. Sources of disease and pest resistance will be identified for current and future efforts in germplasm enhancement and plant breeding. National programs will have their national collections restored.	Genetic resources conserved and breeders have access to genes and genes combination for marker assisted selection and genetic transformation	Better conservation of genetic resources and Increased availability of tools for genetic enhancement
OUTPUT 2 **Bean Improvement For The Tropics**	To increase bean productivity through enhanced access and utilization of improved cultivars and management practices in partnership with NARS and regional networks, and through them, with farmers.	Small farmers in tropical America and Africa (mainly women) will obtain higher and more stable yields. Poor consumers, especially women and children, will benefit from low-cost protein and micronutrients.	Adoption of improved varieties by farmers Best bet IDPM practices and genetic combinations for stable resistance deployed.	More stable production, food availability, better nutritional status and income More stable bean yields More stable production, improved food availability, income and nutrition, especially for the poor and women farmers

	Outputs	Intended User	Outcome	Impact
		The environment and community at large will benefit from reduced pesticide and fertilizer use. Food legume researchers will access an enhanced knowledge base and germplasm.		
OUTPUT 3 **Improved Cassava For The Developing World**	To develop germplas, methods and tools for increased productivity and value of the cassava crop that will result in increased income and development of rural communities involved in cassava growth and processing.	Immediate beneficiaries are farmers growing cassava as a cash crop or for subsistence farming. End users are processing industries related to cassava (for animal feed, for processed food, for starch or derived products) and direct human consumption.	There are three clearly defined objectives based on the most common industrial uses of cassava: a) For the feed industry clones with increased nutritional value; b) for the starch industry clones with novel starch types; c) stable yields for cassava producers	Enhanced industrial uses of the crop. Stronger and consolidated markets for cassava products. Rural development in cassava growing communities. Increased and wider alternatives for farmers growing cassava. Reduced poverty
OUTPUT 4 **Improved Rice For Latin America And The Caribbean**	To produce robust high yielding rice varieties requiring lower inputs, we will provide well-characterized progenitors and advanced materials with an ample genetic base as well as training.	Rice researchers, extensionists and students with priority in Latin America and Caribbean (LAC) and secondary benefits with out partners throughout the world. Ultimate beneficiaries are the LAC rice farmers most of whom are small landholders or renters, and	Better practices in place to reduce losses caused by Rhizoctonia as well as decreased the use of agrochemicals. Prerequisite for developing information based system as it confirms efficacy in local production systems	The ecosystem will be less contaminated and the workers will be healthier. A more competitive rice sector with lower negative impact on the environment

	Outputs	Intended User	Outcome	Impact
		the resource poor consumer for whom rice is a stable food.	The information will be used in participatory farm groups as well as other rice farmers to reduce the yield gap and intensify the farming system. Also a large volume of scientific literature will be published.	The expansion of the genetic base of rice should lead to yield stability and better adaptability for abiotic and biotic stresses.
OUTPUT 5 **Tropical Grasses and Legumes**	To develop and disseminate improved forage-based technologies to enhance productivity, profitability and sustainability of smallholder crop-livestock systems in tropical areas of both low and high potential.	Researchers from NARS, governmental and non-governmental development programs, private seed companies and small and large farmers throughout the sub-humid and humid tropics who need additional grass and legume genetic resources with high potential to intensify and sustain productivity of agricultural and livestock systems.	Farmers in areas of low and high potential diversify forage resources and increase their income by adopting new grass and legumes species New cultivars of grasses and legumes with adaptation to biotic and abiotic stresses are adopted by farmers	More and safe animal products available at reasonable prices to poor rural and urban consumers. New cultivars of *Brachiaria* and legumes with high quality are released and adopted. Higher profitability and sustainability of pasture and cut/carry based livestock systems through planting forage species resistant to biotic constraints. Livelihoods of small livestock farmers improved through more income from animal products.

	Outputs	Intended User	Outcome	Impact
OUTPUT 6 **Tropical Fruits**	To provide partners, local agencies and entrepreneurs with the tools, technologies and methodologies that they can use to better select likely products for development and then to successfully produce, process and market them.	The immediate beneficiaries and users of the outputs of our work with partners are farmer groups, farmers, entrepreneurs, local research and development organizations, importers/exporters of tropical fruits and any development agencies interested in increasing rural incomes in areas where tropical fruits may have a role to play. The final end users are the rural communities that are better able to produce, process and market fruits in such a manner that they improve their own incomes and welfare and also those of future generations.	Rural communities identifying the best options for producing high value products in their own particular niche Producers planting uniform quality elite fruit materials, selected from existing natural variation, well adapted to specific ecological conditions on their farms. Improved institutional performance by NARS, NGOs and other partners, reflected in more effective technology development and dissemination	Producers synchronize production with market demand. Rural communities producing high value products well adapted to their particular ecological conditions. Increased rural income through increased production of high value readily marketed products.

CIAT PROJECT SB-2: CONSERVATION AND USE OF TROPICAL GENETIC RESOURCES

Project Description

Goal: To contribute to the sustainable increase of productivity and quality of mandated and other priority crops, and the conservation of agrobiodiversity.

Objective: To conserve and enhance the genetic diversity and ensure that characterized agrobiodiversity, improved crop genetic stocks, and modern molecular and cellular methods and tools are used by CIAT and NARS scientists, and accessed by farmers, for improving, using, and conserving crop genetic resources.

Important Assumptions: Pro-active participation of CIAT, NARS, and NGOs, agricultural scientists, biologists and development personnel.

Target Ecoregión: Worldwide service, but special focus in developing countries of Latin America, Sub-Saharan Africa, and South and South East Asia.

Beneficiaries and End Users: Small farmers of Latin America, Sub-Saharan Africa, and Southeast Asia will use dozens of germplasm accessions conserved by the gene bank, as such or after improvement through biotechnology tools. Sources of disease and pest resistance will be identified for current and future efforts in germplasm enhancement and plant breeding. National programs will have their national collections restored.

Collaborators: IARCs (IPGRI through the Systemwide Genetic Resources Program, CIP, and IITA through root and tuber crop research, IFPRI, IRRI, CIMMYT, IITA, CIP through HarvestPlus Challenge program; NARS (CORPOICA, ICA, EMBRAPA, IDEA, INIA, INIFAP, UCR, INIAs); as well as the African-based PABRA, ECABREN AND SABRN networks; NGOs (CRS, WVI); UN Agencies (FAO); AROs (USDA-ARS, IRD, CIRAD, Danforth Center, CAMBIA, NCGR, and universities—Cornell, Yale, Clemson, Kansas State, Bath, Hannover, Rutgers, Ghent, Gembloux; biodiversity institutions (A von Humboldt, INBIO, SINCHI, Smithsonian); corporations and private organizations.

Explanation of any Project changes (with respect to previous MTPs): The project takes into account the recent changes introduced by the International Treaty on Plant Genetic Resources for Food and Agriculture. New collection efforts may now be possible for cassava and beans with agreement with the countries. Tropical forages do not, however, enjoy facilitated access status so distribution and conservation of forage genetic resources requires bilateral negotiations on a country by country basis.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	6.081	6.909	6.854	6.891	6.729

CIAT PROJECT SB-2: CONSERVATION AND USE OF TROPICAL GENETIC RESOURCES (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Genomes of wild and cultivated species of mandated and non-mandated crops and of associated organisms are characterized.	Breeders, agronomists and other crop scientists working on/ using these crops and associated organisms.	Production or breeding methods are more efficient as compared to previous years. Varieties with improved or novel traits are produced and adopted.	Farmers' livelihoods are improved by increased crop productivity, by producing new crops for niche markets, or by using varieties that require less pesticides or costly inputs.
Output Targets 2006	• Genome wide PCR base d markers (SNPs, CAPs) developed for beans and cassava. • Scaling-up of marker-assisted established for rice, bean and cassava. • Marker assisted selection for multiple traits implemented in beans, rice and cassava. Target genes for drought identified and tested in beans. • Useful genes and genes combination identified and mapped for high iron and zinc bean lines. • Introgression lines from rice interspecific crosses developed. • Places of bean domestication and races/ genepools identified.	ARIs and NARS in Latin America and Africa with capacity for marker work	Better understanding of genetic structure of diversity of specific crop gene pools. Identification of molecular markers for marker assisted selection	

	Outputs	Intended User	Outcome	Impact
	Lab Information Management System (LIMS) implemented for MAS and molecular biology activities.			
Output Targets 2007	Allele mining in *ex situ/ in situ* collections of wild relatives of beans, and cassava for genes of traits of economic importance.	Breeders and crop geneticists, and conservationists dealing with these crops and their wild relatives.	Breeders and crop geneticists, and conservationists dealing with these crops and their wild relatives are better informed about allelic richness and its possible economic significance.	
Output Targets 2008	Bioinformatics tools developed for data mining in relation to gene functions for traits of economic importance.	Breeders and crop geneticists.	Breeders and geneticists can use sequence data generated on traits of economic importance in beans, cassava, rice and *Brachiaria*.	
OUTPUT 2	Genomes modified: genes and gene combinations used to broaden the genetic base of crops (bean, rice and cassava) and forage species (*Brachiaria*)	Breeders and crop geneticists worldwide working on these crops and relatives.	Breeders and crop geneticists have access to improved lines and genetic stocks, and benefit from increased knowledge about gene function/ regulation.	Better varieties requiring less expensive inputs are made available to NARS and farmers, resulting in gains of productivity, environmental sustainability, and in social benefits.
Output Targets 2006	• Efficiencies for genetic transformation for beans and cassava improved • Genes constructs for traits related to plant disease –	Rice geneticists and breeders around the world but particularly in ARIs	Rice geneticists and breeders have a better understanding of regulation of genes responsible for yield and plant architecture.	

	Outputs	Intended User	Outcome	Impact
	insect resistance, plant stress and nutritional traits obtained for transformation in beans, rice and cassava • T-DNA rice 10,000 mutant collections characterized under field conditions.			
Output Targets 2007	Transgenic events tested under green house biosafety conditions Gene flows in rice and beans documented in farmers'fields in parts of Latin America	ARI and molecular biologists- breeders Biosafety authorities of Latin America.	Biosafety authorities have technical information about risk of gene flow (intensity, location, persistence) for better decision making.	
Output Targets 2008	Transgenic lines of mandated crops generated with different constructs against biotic (e.g. Bt) and abiotic (e.g. DREB) stresses	Cassava and rice breeders at CIAT and in partner countries.	Cassava and forage breeders at CIAT and in partner countries have access to materials with novel genetic diversity to start new breeding activities.	
OUTPUT 3	Increased efficiency of NARS breeding programmes by using biotech tools.	Breeding programs, biodiversity institutions concerned by biosafety issues, extensionists, rural health centers.	Breeding programs, biodiversity institutions concerned by biosafety issues, extensionists, rural health centers make a wider use of biotech tools developed/ improved by CIAT.	Improved varieties raise agricultural productivity and reduce environmental impacts sooner than otherwise would have occurred

	Outputs	Intended User	Outcome	Impact
Output Targets 2006	• Low cost rapid propagation systems implemented at small scale and commercial levels of cassava and other high-value crops. • Improved capacity of Colombian NARS to deal with biosafety.	Breeding programs in Latin America and East Africa and biodiversity institutions concerned by biosafety issues.	Colombian institutions concerned by biosafety issues consider data and technical information generated by CIAT and partners.	
Output Targets 2007	Training on MAS has been provided to several country partners in Latin America and Africa.	Breeders and breeding programs in developing countries.	Breeders and breeding programs in developing countries adopt MAS techniques used/ improved by CIAT.	
Output Targets 2008	Information package delivered to NARS in Latin America and Africa about biofortified crops.	Breeders, extensionists, rural health centers.	Breeders, extensionists and rural health centers take into account the biofortified crops produced by the Biofortification CP.	
OUTPUT 4	Bean, cassava and forage germplasm collections, multiplied, and thus available, restored and safely duplicated. Germplasm conservation methods improved.	CIAT commodity project and external users around the world, namely in Africa, can have access to characterized and viable samples at any time.	Partners and any other public or private institutions use CIAT designated germplasm in own research and development.	Increased and more stable agricultural productivity with less negative environmental impacts.
Output Targets 2006	• 25% of CIAT designated germplasm has been regenerated recently. • 30% of germplasm requests are handled through a user friendly	CIAT projects in Latin America, and East Africa and external users have access to a wider set of diversity for further studies	Partners, namely in Africa, increase the material scope of their research, conservation and development work.	

	Outputs	Intended User	Outcome	Impact
	interface at CIAT website • Slow growth in vitro protocol developed for palms and fruits of economic importance.			
Output Targets 2007	25% of designated germplasm is documented at CIAT website 5% of designated germplasm included in the DNA bank	CIAT projects and external users have direct immediate access to germplasm information for use and research	Wider use of designated germplasm because of its web-based documentation.	
Output Targets 2008	Bean and forage collections safely duplicated at CIMMYT, and cassava at CIP.	(security backups are not intended for use)	Other national genebanks are also making security backups of their collections.	
OUTPUT 5	NARS strengthened in the conservation and utilization of sets of agrobiodiversity	National genebanks, botanic gardens, biodiversity institutes, university departments working in conservation/ utilization of agrobiodiversity.	NARS and national genebanks adopted new conservation methods and make greater use of genetic resources for crop improvement	Increased agricultural productivity and reduced environmental impacts
Output Targets 2006	• Genebank handbook produced in English and Spanish.	National genebanks, botanic gardens, biodiversity institutes, university departments running some *ex situ* conservation facility.	NARS and national genebanks across Latin America and Africa use the handbook.	
Output Targets 2007	Public awareness products for institutions working in *ex situ* conservation.	National genebanks, botanic gardens.	National genebanks, botanic gardens have material to explain their work.	

	Outputs	Intended User	Outcome	Impact
Output Targets 2008	Distance education, presential courses run.	NARS dealing with aspects of conservation/ utilization of germplasm collections.	Personnel trained and/ or updated in conservation methods (e.g. DNA bank)	
OUTPUT 6	Strengthening Stressed Seed Systems during Emergency and Recovery	NGOs and UN Agencies involved in crisis response	Personal involved in making assessments related to seed security assessment and interventions have clear set of tools to improve practice	Strengthening (rather than undermining) of seed systems—during crisis periods- and hence enhanced contribution to food security
Output Target 2006	• Development of Seed System Security Assessment (SSSA) Tools	NGOs and UN Agencies involved in crisis response	Targeting of emergency agricultural aid to meet real user needs	
Output Target 2007	Clarification of the effects on Longer-term Seed Aid Assistance—so as to guide chronic stress response (model country: Ethiopia)	NARS and UN Agencies, involved in both emergency and developmental response	Identification of better seed systems development options for most vulnerable populations (i.e. those receiving aid on repeated basis)	
Output Target 2008	Application of more effective response options in both acute and chronic stress seed system scenarios	NARS, NGOs and UN Agencies involved in Agricultural Reconstruction and Development	Matching of seed system support to problem identification in variety of stressed seed system contexts.	

CIAT PROJECT IP-1: BEAN IMPROVEMENT FOR THE TROPICS

Project Description

Goal: To obtain a lasting increase in food availability and income for the poor through improved bean productivity.

Objective: To increase bean productivity through enhanced access and utilization of improved cultivars and management practices in partnership with NARS and regional networks, and through them, with farmers.

Important assumptions: Regional bodies and national governments continue to give priority to bean production. Partners and providers of research and extension services are willing to incorporate and commit resources to innovative approaches to reach end users. Core research capacity and budgets maintained. Continued success in attracting special project funding. Continued donor support to regional networks. Resources in challenge programs accessed.

Target Ecoregions: East-Central and southern Africa. Neotropical regions of Mexico, Central America, the Caribbean, Brazil and the Andean zone.

Beneficiaries and users: Small farmers in tropical America and Africa (mainly women) will obtain higher and more stable yields. Poor consumers, especially women and children, will benefit from low-cost protein and micronutrients. The environment and community at large will benefit from reduced pesticide and fertilizer use. Food legume researchers will access an enhanced knowledge base and germplasm.

Collaborators: *Regional networks in Africa and Central America*: AfNet, ASARECA, CORAF/WECARD, ECABREN, SABRN, SACCAR, SADC/FANR, and SICTA. *NARS:* Central America (7), the Caribbean (3), the Andean zone (5), Brazil, East Africa (9) and southern Africa (10). *CGIAR centers:* ICRAF, CIMMYT, IITA, CIP, IRRI, ICARDA, ICRISAT. *Systemwide programs*: IPM program and African Highland Initiative (AHI). *Other international institutions:* EAP-Zamorano, ICIPE, Bean/Cowpea CRSP. *Diffusing technology*: More than 30 NGOs, churches, relief and governmental agencies, and entrepreneurs. *ARI's*: more that 20 universities and 10 other ARI's in Australia, Europe and North America. *HarvestPlus CP*: NARS in Brazil and East Africa; ARI's in 3 countries. *Generation CP*: NARS in 5 countries; ARI's in 2 countries.

Explanation of project changes: In light of the distinction drawn by the Science Council between output targets and outcomes, and in an effort to focus, two of our outputs from the 2005 Log Frame (outputs 4 and 5) that dealt with services provided to NARS have been combined into one (output 4). This presentation is more succinct and to the point.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	4.648	4.509	4.473	4.498	4.392

CIAT PROJECT IP-1: BEAN IMPROVEMENT FOR THE TROPICS (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Improved, small-seeded, bean germplasm resistant to major biotic and abiotic stresses with greater nutritional and market value	NARS and farmers in Central America, the Caribbean, Brazil, East Africa	Adoption of improved varieties by farmers	More stable production, improved food availability, better nutritional status and income to farmers
Output Targets 2006	Ten lines tolerant to low nitrogen and phosphorus and acid soil complex available to NARS, farmers and other partners in Africa (DRC, Kenya, Tanzania, Rwanda, Madagascar, Malawi, and Sudan), and 20 drought tolerant, disease resistant lines validated in 5 countries in Central America / Caribbean	NARS, NGO's, and CBO's	Lines tolerant to low fertility are used widely by partners	
	~40 small seeded F6-derived F7 families combining 40% higher mineral content and moderate drought resistance developed (HarvestPlus)	NARS, NGO's, and CBO's	Lines with high mineral content and drought tolerance are used widely by partners	

	Outputs	Intended User	Outcome	Impact
Output Targets 2007	5-10 interspecific progeny between common bean and *P. coccineus* that broaden the genetic base for resistance to aluminum; resistance to ALS, root rots, anthracnose; and/or high mineral content	CIAT breeders	Breeders incorporate broader diversity into populations	
Output Targets 2008	At least 40 lines combining drought tolerance with resistance to BCMNV, root rots, and/or ALS available for testing in Africa	NARS, NGO's and CBO's	Drought tolerant lines with critical resistance genes are used in drought prone areas	
	~30 small seeded F3-derived F5 families developed with tropical adaptation, 80% more minerals, abiotic tolerance, and 2 resistances (HarvestPlus)	NARS, NGO's and CBO's	Drought tolerant lines with critical resistance genes and high mineral content are used in drought prone areas	
OUTPUT 2	Improved, large-seeded, bean germplasm resistant to major biotic and abiotic stresses with greater nutritional and market value	NARS and farmers in the Andean zone, the Caribbean, East and southern Africa	Adoption of improved varieties by farmers	More stable production, improved food availability, better nutritional status and income to farmers

	Outputs	Intended User	Outcome	Impact
Output Targets 2006	15 climbing bean lines with heat tolerance and BCMNV resistance distributed to NARS and network partners in Andean region, East Africa and Southern Africa	NARS, NGO's and CBO's	Partners use climbing beans adapted to elevations down to 1200 masl in 4 Andean countries and 6 African countries	
	Small-to-medium seeded climbers with tropical adaptation and 40% more minerals developed (HarvestPlus)	NARS, NGO's and CBO's	Climbing beans with high mineral content and adaptation to tropical conditions available to partners	
Output Targets 2007	15 new large-seeded bush lines with high mineral trait and resistance to 2 diseases, mainly in the red mottled and red seed classes (HarvestPlus).	NARS and NGO's	High iron lines adopted	
Output Targets 2008	15 new large seeded climbing beans with high mineral trait (HarvestPlus)	NARS, NGO's and farmers' groups	High mineral lines incorporated into production system	
OUTPUT 3	Strategies developed for managing diseases and pests in bean-based cropping systems	Breeders, entomologists and pathologists in CIAT and NARS	Best bet IDPM practices and genetic combinations for stable resistance deployed.	More stable bean yields contributing to food security of farmers
Output Targets 2006	Resistance genes tagged in 3 sources of Pythium resistance, 2 sources of ALS resistance, and 1	Pathologists, entomologists and breeders in NARS (NARO-Uganda and	Efficiency of selection for resistance is improved	

	Outputs	Intended User	Outcome	Impact
	source of Apion resistance	KARI-Kenya)		
Output Targets 2007	Method available to quantify 2 major soil borne pathogens (*Pythium ultimum* and *Fusarium solani*), as a tool to assess disease management strategies, and to refine management of resistance breeding nurseries.	Pathologists in CIAT and NARS	Improved efficiency in genetic improvement and in control of disease	
Output Targets 2008	Multiple gene combinations to manage ALS developed through MAS	CIAT and NARS breeders	Per cent of resistant lines in breeding program increased	
OUTPUT 4	Approaches and methods developed and available for strengthening institutional, organizational and collaborative capacity of NARS and sub-regional networks in Africa and Latin America	NARS in Africa and Latin America	Improved institutional performance by NARS, NGOs and other partners, reflected in more effective technology development and dissemination	More stable production, improved food availability, income and nutrition, especially for the poor and women farmers
Output Targets 2006	Strategies and networking mechanisms refined and promoted for sustainable seed production and dissemination of technologies in fourteen countries in east and southern Africa	NARS, Bean networks, NGOs, seed companies, CBOs	National strategic alliances established, internally monitored and reaching one million people in Africa with improved varieties and/or crop management technologies	

	Outputs	Intended User	Outcome	Impact
	Methods and tools developed and made available for participatory plant breeding in 10 PABRA countries	NARS, NGOs, CBOs, farmers	More cost-effective NARS in development and dissemination of technology	
Output Targets 2007	Innovative approaches and tools developed and made widely available to partners in Kenya, Malawi, Uganda, and Tanzania for IPDM and marker-assisted selection of varieties	NARS, NGOs, CBOs and farmers.	Increased use of IPDM strategies that enable R&D institutions to reach more farmers, and of marker-assisted methods that improve cost-effectiveness in breeding new varieties	
	Breeding programs for biofortification established in Honduras, Brazil, Bolivia, Venezuela, Kenya and Malawi.	NARS, NGOs, and farmers	NARS breeders select lines with higher mineral content	
Output Targets 2008	An IPM system for whiteflies on snap beans refined and promoted in major bean producing areas of the Andean zone	NARS, NGO's, CBO's	Pesticide use is reduced, production assured, and profitability increased	

CIAT PROJECT IP-3: IMPROVED CASSAVA FOR THE DEVELOPING WORLD

Prject Description

Goal: To improve the livehoods of rural populations in LAC, Africa, and Asia by increasing cassava productivity while protecting the environment and enhancing the value of products derived from this crop.

Objective: To develop germplasm, methods and tools for increased productivity and value of the cassava crop that will result in increased income and development of rural communities involved in cassava growth and processing.

Important Assumptions: Political and institutional support for sustainable rural and agricultural development at the reference sites and targeted countries is maintained. Donor support continues and link to CLAYUCA and the private sector remains strong. Natural disasters and civil strife do not impede progress toward contributing to project's goal. Absence of drastic changes in the price of maize as commodity that greatly affects cassava competitiveness.

Target Ecoregions: Tropical, Sub-tropical ecoregions of LAC, Africa and Southeast Asia.

Beneficiaries and end Users: Immediate beneficiaries are farmers growing cassava as a cash crop or for subsistence farming. End users are processing industries related to cassava (for animal feed, for processed food, for starch or derived products) and direct human consumption.

Collaborators: NARs in Asia (particularly in Thailand, Vietnam, China, India and Indonesia), Latin America (particularly Brazil, Colombia, Cuba, Dominican Republic, Mexico, Haiti, Nicaragua, Peru and Venezuela), an Africa (Ghana, Ivory Coast, Nigeria, South Africa, Mozambique, Zambia, Malawi, Tanzania, and Uganda). IITA and IFPRI (CG Centers), CLAYUCA, and private sector involved in cassava processing. Advanced research laboratories (Danforth Center, Cornell, Clemson University, Ohio State University, and USDA in the USA; Wageningen University in The Netherlands Uppsala University in Sweden, KVL University in Denmark and ETH in Switzerland).

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	2.271	2.440	2.421	2.434	2.377

CIAT PROJECT IP-3: IMPROVED CASSAVA FOR THE DEVELOPING WORLD (2006-2008)

	Outputs	Intended users	Outcome	Impact
OUTPUT 1	Genetic stocks improved gene pools developed and transferred to national programs.			
Output Targets 2006, 2007, and 2008	Generation, identification and transfer to national programs of elite cassava germplasm with high and stable productivity.	National research programs and cassava farmers and communities in Africa, Asia and Latin American and the Caribbean (LAC).	Consolidation and strengthening of cassava-based agriculture.	Increased and stable income of cassava farmers and processing facilities. Enhanced food security of rural communities that grow cassava. Rural development.
Output Targets 2007	Identification, indexation and transfer to national programs of cassava clones identified with higher than normal protein levels.	National research programs, private sector, processing companies and cassava farmers in Africa, Asia and LAC. Universities and advanced laboratories in developed countries.	Enhanced interest of the feed industry (domestic and export markets) to incorporate cassava as source of energy in the diets taking advantage of reduced need for additional sources of protein.	Enhanced nutritional status of people consuming roots, particularly in Africa. Increased value of stronger markets for cassava products. Alternative sources of raw material for the feed industry.
Output Targets 2008	Identification, indexation and transfer to national programs of cassava clones with new starch quality traits.	National research programs, private sector, processing companies and cassava farmers in Africa, Asia and LAC. Universities and advanced laboratories in developed countries.	Enhanced interest of the starch industry (domestic and export markets) to incorporate cassava as source of raw material in their operations.	Increased value and stronger markets for cassava products. Higher income of cassava communities. Reduced environmental impact in the process of production of modified starches.

	Outputs	Intended User	Outcome	Impact
OUTPUT 2	New methods for cassava breeding developed			
Output Targets 2007	First systemic study of inbreeding depression in cassava conducted and published.	Scientists from national programs and universities in developing and developed countries.	Proof of concept that inbreeding of cassava facilitates its genetic improvement. Sustained and faster genetic gains for cassava to compete with other crops like maize	Increased and more stable income of cassava farmers and processing facilities. Enhanced food security of rural communities that grow cassava.
Output Targets 2008	First evaluation of hybrids from partially inbred parental clones. By definition these parents have reduced genetic load and are better parents than those currently used.	Breeders from national programs and universities in developing countries. Scientists working with other crops in developing and developed countries.	Better hybrids will lead to increased and more stable income of cassava farmers and processing facilities.	Increased and more stable income of cassava farmers and processing facilities. Enhanced food security of rural communities that grow cassava. Sustained and faster genetic gains for cassava to compete with other crops like maize.
OUTPUT 3	Research on the industrial uses of cassava and elite germplasm produced			
Output Targets 2006	Stability of high- and low-amylose traits evaluated in contrasting clones. Similar study for high-protein.	Scientists from national programs and universities in developing and developed countries. Starchand feed industries	Cassava breeding projects in Asia, Africa and LAC shift their objectives towards the development of high-value cassava clones.	Stronger markets for cassava. Rural development in cassava growing communities and reduction of poverty.

	Outputs	Intended User		Impact
				Better competitiveness of tropical agriculture.
Output Targets 2007	Field evaluation of S1 plants from mutagenized cassava plants and results of TILLING	Scientists from national programs and universities in developing and developed countries.	Identification of commercially useful cassava mutants. Proof of concept of novel technologies.	A waxy cassava starch has been always requested by the starch industry. This output aims at delivering such product. Better competitiveness of tropical agriculture.
Output Targets 2008	Field evaluation of first cycle of recurrent selection for high- or low-amylose starch.	Scientists from national programs and universities in developing and developed countries.	Cassava breeding projects learn to interact with processing sector and deliver products better suited for their needs. Shift in breeding objectives and methods at NARs.	Enhanced industrial uses of the crop. Stronger markets for cassava. Rural development in cassava growing communities and reduction of poverty. Alternative sources of financing cassava research in Africa, Asia and LAC.
OUTPUT 4	Development and use of biotechnology tools for cassava improvement			
Output Targets 2006	Results of the first generation of germplasm introduced into Africa using molecular marker for ACMV consolidated	Scientists from national programs and universities in developing and developed countries. Cassava farmers in Africa.	Deployment of a new approach to introduce cassava germplasm in Africa.	Improved cassava health and productivity, particularly in Eastern African Countries.

	Outputs	Intended User		Impact
Output Targets 2007	Development of markers for high-beta carotene, protein, and/or dry matter content in cassava roots. Results from first field-evaluation of transgenic cassava. Validation of MAS in cassava-breeding at NARs.	Scientists from national programs and universities in developing and developed countries.	Cassava is no longer a *neglected* crop: biotechnology tools have been adapted and contribute in its genetic improvement: More efficient genetic improvement of cassava.	Increased and more stable income of cassava farmers and processing facilities. Enhanced food security of rural communities that grow cassava, particularly in Africa.
Output Targets 2008	Identificiation of root promoters for genetic transformation using genes to be expressed in the roots.	Molecular breeders cassava and other root crops) from national programs and universities in developing and developed countries.	Cassava roots are its more important economic product. Identification and cloning of root promoters are fundamental for the genetic transformation of the crop with genes affecting root quality traits.	Enhanced economic value of cassava. Improved nutritional conditions of communities where cassava is an important component of diet. More efficient breeding methods will lead to faster and more consistent genetic gains. Root promoters found in cassava can help other root and tuber crops as well.
OUTPUT 5	Breeding for insect, arthropods and disease resistance and development of alternative methods for their control			

	Outputs	Intended User	Outcome	Impact
Output Targets 2007	Significant progress in identifying and eventual cloning of the resistance gene(s) for white flies found in cassava germplasm (MECU 72)	Field and molecular breeders and entomologists from national programs and universities in developing countries.	Combined with resistance to the African Cassava Mosaic Virus a stable and effective solution to ACMV problem in Africa can be obtained.	Improved health and productivity of cassava. Sustainable cassava production, particularly in Africa. Potential benefit to other crops in developed countries (e.g. tomato in Europe) leading to a reduction in the use of pesticides.
Output Targets 2008	Introgression of genetic variability from wild *Manihot* species in search of resistance genes for insects and diseases.	Breeders, entomologists and pathologists from national programs and universities in developing and developed countries. Cassava farmers.	Better understanding and exploitation of the genetic variability in the *Manihot* gene pool. Scientific justification for the need of exploration and conservation of genetic resources.	Improved cassava health and productivity. Increased south-to-south collaboration between Brazilian and African research institutions.
OUTPUT 6	Increasing the productivity of cassava in Asia using farmer participatory method			

	Outputs	Intended User	Outcome	Impact
Output Targets 2006	On-station research on cassava leaf production, preparation of root and leaf silage, and more productive pig and goat feeding. Value-adding of cassava roots through small-scale processing. Training in cassava production, animal feeding and farmers' participatory research (FPR) methodologies.	Researchers and extensionists from national programs, cassava farmers and/or small-scale processors. Cassava breeding project at HQ and NARs in Africa. Households involved swine production, particularly the women that typically are in charge of feeding them	Improved nutrition and health of farm animals fed with cassava roots and leaves, especially during the dry season.. Enhanced research capacity of NARs.	Increased and more stable income for farmers. Enhanced research capacity in countries that urgently need it. Improved conditions of women who typically are responsible of feeding pigs in households in many different countries.
Output Targets 2007	FPR trials on newly introduced clones and balanced fertilizer use established in Cambodia , East Timor (ET) and Laos. Collection and evaluation of local varieties in these countries.		Improved yields and more sustainable production of cassava in Laos, Cambodia, Indonesia and ET.	Increased and sustainable income for farmers. Reduction of the negative impact on the environment of cassava cultivation, particularly in marginal and sloped land.
Output Targets 2008	Increasing adoption of improved varieties, balanced fertilization, soil conservation practices and use of cassava roots and leaves for on-farm animal feeding.		Improved yields and more sustainable cassava production in target countries. Increased and more stable income for farmers. More alternatives for the use of cassava products open to farmers.	Increased and sustainable income for farmers. Protection to the environment. Poverty alleviation.
OUTPUT 7	Latin American and the Carribean Consortium on cassava (CLAYUCA). Latin American and the Carribean Consortium on cassava (CLAYUCA)			

	Outputs	Intended User	Outcome	Impact
	Note: the following are contributions and collaborations that CLAYUCA and IP3 will be having during the next three years. CLAYUCA's work is complementary in some areas to IP3's agenda.			
Output Targets 2006	Consolidation of technological packages for cassava production systems based on mechanization of planting and harvesting.	Cassava agro-industrial projects with emphasis in Colombia, Venezuela, Ecuador, Mexico, Nigeria, South Africa. National research programs.	Sustainable cassava production systems in the region. Alternatives for a significant reduction in production costs and enhanced productivity of cassava.	Higher income for cassava growers and processors. Enhanced food security for cassava growers and processors. Rural development in cassava growing and processing countries and regions.
Output Targets 2007	Evaluation of germplasm with enhanced nutritional value in farmer-managed conditions in three regions of Colombia and research on different processing approaches.	Cassava agro-industrial projects in Colombia and other countries in the region.	High-value cassava germplasm available for agro-industrial projects, national research programs, cassava producers and processors.	Higher economic value for cassava production systems. Rural development in cassava growing communities.
Output Targets 2008	Cassava foliage productions systems validated under commercial conditions and improved cassava germplasm for foliage production identified.	Cassava agro-industrial projects in Colombia and other countries in the region.	Cassava foliage consolidated as a raw material for animal feeding systems.	Higher income for cassava farmers. Enhanced food security. South-to-south cooperation.

CIAT PROJECT IP-4: IMPROVED RICE FOR LATIN AMERICA AND THE CARIBBEAN

Project Description

Goal: To generate food security and employment associated with rice production with emphasis on improving the options for the small farmers.

Objective: To produce robust high yielding rice varieties requiring lower inputs, we will provide well-characterized progenitors and advanced materials with an ample genetic base as well as information and training.

Important Assumptions: There are opportunities for growth in the rice sector, because in contrast with Asia, land and water are abundant in Latin America. The rice sector faces risks because there is a trend for more open markets and many exporting countries outside of Latin America subsidize rice production. In Latin America, most rice producers are small farmers and the governments in this region tend not to subsidize rice production. Therefore, the Rice Project focuses on strengthening the rice sector. Traditionally, we have concentrated on developing advanced materials with ample genetic diversity that incorporates the local desired grain quality with resistance to the pest and diseases common in this region. Also unlike Asia, most of the rice in Latin America is planted by direct seeding. Since many small farmers do not have irrigated infrastructure, we are increasing our research on rice that has better tolerance to water stress. This is a global effort that is being coordinated through the Generation Challenge Program. For the small farmers, we put in place participatory variety selection and breeding to promote early maturity high yielding rice, which gives their families the food security needed to experiment and adopt higher value crops. To increase the genetic diversity, we work with interspecific crosses, composite populations, recurrent selection and are developing biotechnology methods that allow the incorporation of traits more efficiently. To sustain yields preventing the pressure of pests and diseases, we work in collaboration with our partners to disseminate Integrated Crop Management practices. To increase the nutritional value of rice, we are developing advanced lines with have higher levels of iron and zinc. We have an alliance with CIRAD and IRD of France that is vital to our research activities. To increase our impact, we work with FLAR and partners in more than fifteen countries to develop new varieties. To reach the farmers, we are collaborating to develop local specific information that can make rice farming more efficient, including web disseminated information.

Target Ecoregion: Low and Mid Altitude Regions of Latin America and the Caribbean.

Beneficiaries and End Users: Rice researchers (public and private), extensionists and students with priority in Latin America and Caribbean (LAC) and secondary benefits with our partners throughout the world. Ultimate beneficiaries are the LAC rice farmers most of whom are small landholders or renters, and the poor consumer for whom rice is a staple food.

Principal Collaborators: ARIs: France CIRAD, IRD & Genoplante, FLAR, IRRI, WARDA, Harvest Plus, Generation Challenge Program, Japan JIRCAS, IAEA, Canada

CIDA and FAO. LAC National Collaborators: Brazil EMBRAPA & IRGA, Colombia FEDEARROZ, CORPOICA, U. Nacional U. del Tolima & U. de Antioquia, Peru INIA, Venezuela INIA, IVIC, FUNDARROZ & DANAC, Cuba IIA, Nicaragua INTA, Costa Rica CONARROZ, SENUMISA, INTA & U. Costa Rica, Guatemala ARROZGUA, Mexico Consejo Mexicano del Arroz, Bolivia CIAT Santa Cruz, ASPAR & CONARROZ, Dominican Republic IDIAF, Chile INIA, Panama U. de Panama, Uruguay INIA, Argentina INTA, CIB-FIBA, U. Corrientes & U. Tucumán, Central America FECARROZ, US Universities: KSU, Cornell, Purdue, LSU, U. Arkansas, Texas A&M, U. Missouri, Rutgers, and Yale.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	2.135	2.076	2.060	2.071	2.022

CIAT PROJECT IP-4: IMPROVED RICE FOR LATIN AMERICA AND THE CARIBBEAN (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1: Enhanced gene pools	Advance breeding lines and gene pools with augmented genetic diversity that incorporate traits that increase biotic and abiotic resistance, improve yield and grain quality for both irrigated and upland rice.	Rice researchers, FLAR, and breeding programs throughout the region including both, public and private sectors	More efficient breeding methods that produce high yielding robust rice varieties that grow well with lower inputs and tolerate biotic and abiotic stresses that will be released by both the public and private sector.	A robust rice sector will generate employment and maintain low rice prices for the consumers. The expansion of the genetic base of rice is leading to yield stability and better adaptability for abiotic and biotic stresses.
Output Targets 2006 .	Enhanced gene pools and advanced lines with disease resistance to rice blast and rice hoja blanca complex that are high yielding with good grain quality for both irrigated and upland rice	Rice researchers, FLAR, and breeding programs throughout the region including both, public and private sectors	Rice breeding methods and strategies for development, evaluation and selection of promising rice lines that result in varieties released by the rice sectors resulting in higher rice yields.	
Output Targets 2007	Advanced lines arising from interspecific crosses and recurrent selection will have been widely distributed and tested in more than 11 countries throughout the region	FLAR and rice breeding programs throughout the region	These interspecific crosses and recurrent selection populations will be a major basis for expanding the genetic diversity of cultivated rice in LAC.	

	Outputs	Intended User	Outcome	Impact
Output Targets 2008	Using Marker Aided Selection techniques for quality traits, selected disease resistance as a means of reducing the time and cost of varietal development. Environmental biosafety studies and practices defined for the use of biotechnology derived rice varieties	FLAR and Rice breeding programs throughout the region	Rice breeding strategies for evaluation and selection of promising rice lines that result in more and better varieties eleased by the at a faster rate by rice sector.	
OUTPUT 2: Integrated crop, pest and disease Management	Pest, pathogen and plant interactions will be characterized and varieties, methodologies and practices developed to help control the major pests and pathogens of rice in Latin America.	Rice scientists, extension agents and rice farmers	The molecular and other techniques will lead to the development of resistance varieties. Improved cultural practices that will result from the understanding of the interactions and better varieties will lead to more stable rice production.	The improved cultural practices and varieties will lead to lower use of agrochemicals and increased yields. This will mitigate of contamination of the environment leading to better health for the farmers and the community. Also the cost of production will be lower which will benefit the farmer.

	Outputs	Intended User	Outcome	Impact
Output Targets 2006	Characterization of the diversity of the Rhizoctonia pathogen and transfer of technology to partners	Rice pathologists and breeders	The reduction of losses and the use of agrochemicals that are needed to prevent losses caused by Rhizoctonia.	
	Integrated Pest, Disease, and Crop Management strategies adapted for at least 5 countries.	Rice scientists, extension agents and farmers.	Prerequisite for developing information based system as it confirms efficacy in local production systems.	
Output Targets 2007	Characterization and development of molecular markers for rice hoja blanca virus resistance and for 6 major rice blast resistance genes	Rice pathologists and breeders	The development of Marker Aided Selection (MAS) for rice hoja blanca and blast to increase breeding efficiency and provide durable varietal based solutions.	
	Understanding the pest and disease complex associated with the invasive mite, *S. spinki*.	Rice scientists, extension agents and rice farmers	The use of IPM will reduce losses caused by the complex of *S. spinki* and diseases.	
Output Targets 2008	Characterization and development of molecular markers for planthopper and Rhizoctonia resistance genes	Rice pathologists and breeders	The development of MAS for Rhizoctonia and *T. orizicolus* for more efficient rice breeding.	
	Advanced sources of Rhizoctonia resistance available for at least five countries of LA.	Rice pathologists and breeders	Develop resistance lines to reduce losses caused by Rhizoctonia	

	Outputs	Intended users	Outcome	Impact
OUTPUT 3: Intensification and diversification of rice systems for small farmers	Specialized varieties for small farmers, and ICPM information systems that can be distributed both electronically and through participatory activities.	Rice scientists, extension agents and rice farmers with emphasis on the small farmers.	Better organized small farmers who have food security, which gives them the option to diversify and grow high value crops. Also better information systems to augment the extension activities throughout Latin America.	More competitive rice production so that the sector thrives even when faced with more open markets. This will lead to a dynamic and robust rice sector that improves the livelihoods of small farmers.
Output Targets 2006 .	Varieties including specialized high value rice (ethnic) and management practices (organic) developed for small rice farmers using participatory methods in two countries in Central America.	Small farmers who produce rice and extension agents.	Better-organized small farmers. Increased yields and options that allow crop diversification including high value crops.	.
Output Targets 2007	Integrated Crop and Pest Management information developed and available in print and electronic media.	Rice scientists, extension agents and rice farmers.	The information will be used in participatory farm groups as well as other rice farmers to reduce the yield gap and intensify the farming system. Also a large volume of scientific literature will be published.	
Output Targets 2008	Varieties and management practices developed for	Small holders who produce rice and extension agents.	Increased yields and options that allow additional crops	

	Outputs	Intended users	Outcome	Impact
	small rice farmers using participatory methods in 6 countries in LAC.		during the year.	

CIAT PROJECT IP5: TROPICAL GRASSES AND LEGUMES: OPTIMIZING GENETIC DIVERSITY FOR MULTIPURPOSE USE

Project Description

Goal: To improve the livelihoods of poor rural livestock communities and contribute to greater access of poor urban consumers to high and safe quality animal products by strengthening forage-based feeding systems while taking advantage of the potential of forages to enhance natural resource management and provide environmental services

Objective: To develop and disseminate improved forage-based technologies to enhance productivity, profitability and sustainability of smallholder crop/livestock systems in tropical areas of both low and high potential

External Conditions: Livestock development is key for alleviating poverty given that livestock are an important part of the livelihoods of many small farmers and that high growth in demand for animal products in developing countries is expected. However, a large proportion of the land in the humid and sub-humid tropics that supports smallholder crop/livestock systems is in different stages of degradation, which leads to low productivity, deforestation and poverty. In addition, resource-poor farmers in these regions have shortage of labor to collect feed from forest or wastelands and as a consequence livestock intensification is severely limited. Thus, restricted access to feed resources is a growing constraint for many poor livestock producers in tropical regions. Development and dissemination of improved forage technologies can improve livelihoods of small livestock producers while contributing to forest conservation, to the restoration of degraded agricultural land and to more abundant, cheaper, and safer high quality animal products for rural and poor urban consumers.

Important Assumptions: 1) International and national policies as well as livestock services are directed to favor small-scale producers to allow them to link to commodity markets; 2) Resources (unrestricted and restricted core) are identified to support Forage R&D in LAC, SE Asia and Africa; 3) The alliance with private forage seed companies continues to be strong to facilitate diffusion and adoption of improved forage cultivars.

Target Ecoregions: Tropical grasses and legumes being developed at CIAT are targeted to three main agroecological zones in the tropics: Savannas, Forest Margins and Hillsides/Uplands. These agro-ecosystems are characterized by low fertility soils and variable rainfall, ranging from sub-humid (600- 1500 mm/year rainfall and 4-8 months dry season) to humid (2,000 to 4,500 mm/year rainfall and limited or no dry season stress). A common constraint across the three targeted agro-ecosystems is low quantity and quality of forage biomass available to feed livestock (ruminants and non-ruminants); as a result animal production and productivity is low and environmental degradation is high.

Beneficiaries and End Users: Researchers from NARS, governmental and non-governmental development programs, private seed companies and small and large

farmers throughout the sub-humid and humid tropics who need additional grass and legume genetic resources with high potential to intensify and sustain productivity of agricultural and livestock systems.

Collaborators: Australia: QDPI, CSIRO and Curtin University; **Brazil:** EMBRAPA; **Cambodia:** NAHPIC; **China:** South China University and CATAS; **Colombia:** Universidad de Sucre, REVERDECER, Universidad Nacional de Colombia-Palmira, Universidad de la Amazonía, CORPOICA, FIDAR, Universidad Nacional de Colombia-Bogotá, Universidad de los Llanos and Fundación Universitaria San Martin; **Costa Rica:** UCR, MAG, Corporación de Fomento Ganadero, ECAG and CATIE; **Uganda:** African Highland Initiative and National Agricultural Research Organisation (NARO); **Ethiopia:** Areka Agricultural Research Institute, FARM Africa, International Livestock Research Institute (ILRI), Land-O-Lakes, Melkassa Agricultural Research Center and EARO; **Germany:** University of Goettingen, University of Hohenheim and University of Hannover; **Guatemala:** Asociación de Criaderos de Ganado Brahman and MAGA; **Honduras:** DICTA, FENAGH, GTZ and SERTEDESO; **India:** ILRI and ICRISAT; **Japan:** JIRCAS, Jokkaido University and National Grassland Research Institute; **Kenya:** ILRI, IFDC-CIMMYT and ICRAF; **Lao, PDR:** NAFRI and NAFE; **Malawi:** Department of Agricultural Research Service (DARS); **Mexico:** Semillas Papalotla and INIFAP; **Nicaragua:** INTA, MAG-FOR, FAGANIC, and Asociación Campos Verdes; **Nigeria:** IITA; **Philippines:** PCARRD and ViSCA; **Switzerland:** ETH; **Thailand:** DLD, PCANRC; **United States:** University of Kentucky and Rutgers University; **Vietnam:** NIAH and DARD

Project Changes: Since the last MTP 2004-2007, the Tropical Forage Project modified the goal and purpose.
Previous Goal: Contribute to the improved welfare of small farmers and urban poor by increasing milk and beef production while conserving and enhancing the natural resource base
Comment: As written the goal placed too much emphasis on milk and beef when increasingly we are working on other kinds of livestock (such as monogastrics) and other kinds of benefits (such as freeing up labor) that improve poor farmers welfare and contribute to lower price of animal products for poor rural and urban consumers.
New Goal: To improve the livelihoods of poor rural livestock communities and contribute to greater access of poor urban consumers to high and safe quality animal products by strengthening forage-based feeding systems while taking advantage of the potential of forages to enhance natural resource management and provide environmental services
Previous Objective*:* To develop and deliver to farmers superior gene pools of grasses and legumes for sustainable agriculture systems in sub-humid and humid tropics.
Comment: The objective as written implied that we are only involved in development and transfer of new forage cultivars. Increasingly we are working on the development of forage- based technologies that benefit livestock farmers (such as seed delivery system, or adding value to forage through processing) in areas of low and high potential for development of small holder livestock enterprises.

New Objective: To develop and disseminate improved forage-based technologies to enhance productivity, profitability and sustainability of smallholder crop/livestock systems in tropical areas of both low and high potential.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	2.610	2.464	2.444	2.458	2.400

CIAT PROJECT IP5: TROPICAL GRASSES AND LEGUMES: OPTIMIZING GENETIC DIVERSITY FOR MULTIPURPOSE USE (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Grasses and legumes with high forage quality attributes developed	CIAT and NARS researchers, seed companies and farmers	New cultivars of *Brachiaria* and legumes with high quality are released and adopted by farmers in LAC, Asia and Africa	Increased production of livestock fed high quality grasses and legumes
Output Targets 2006	Selected at least 10 *Brachiaria* hybrids with high leaf digestibility (>60%) and protein (>10%) Defined the role of tannins and fiber quality in legumes on methane production	CIAT researchers CIAT, ARIS and NARS researchers	New genotypes incorporated into the Brachiaria breeding program to develop high quality cultivars Development of feeding systems that contribute to less methane emissions by ruminant animals	
Output Targets 2007	Defined effect of environment (soil fertility and rainfall) on quality of 5 selected shrub legumes	CIAT and NARS researchers	Environmental "niches" to grow shrub legumes with tannins in LAC and Africa better defined	
Output Targets 2008	Nutritional synergies of using mixtures of shrub legumes with and without tannins assessed with sheep and milking cows	NARS researcher and farmers	Farmers in LAC, Asia and Africa adopt the use of legume mixtures to maximize efficiency of use of forage- based supplements	
OUTPUT 2	Grasses and legumes with known reaction to pest and diseases and interactions with symbiont organisms developed	CIAT and NARS researchers, seed companies and farmers	New cultivars of *Brachiaria* and legumes with resistance to prevalent pests and diseases are released and	Increased profitability and sustainability of livestock production through planting grasses and legumes resistant to major

	Outputs	Intended User	Outcome	Impact
			adopted by farmers in LAC	pests and diseases
Output Targets 2006	At least 10 *Brachiaria* hybrids with combined resistance to at least 3 species of spittlebug developed Screening method to assess resistance to *Rhizoctonia* foliar blight in *Brachiaria* streamlined in the breeding program	NARS researchers CIAT and NARS researchers	Selected *Brachiaria* hybrid with resistance to spittlebug tested in different regions in LAC Selected *Brachiaria* hybrids resistant to *Rhizoctonia* foliar blight tested in different regions in LAC and Asia	
Output Targets 2007	Alkaloid profile of the endophyte (*Acremonium*)/Brachiaria association elucidated	NARS and ARIS researchers	Defined if alkaloids present in endophyte-Brachiaria association are toxic to sheep	
Output Targets 2008	At least 20 tetraploid *Brachiaria* hybrids identified with *Rhizoctonia* foliar blight resistance as high as that of the commercial *B. decumbens* cv Basilisk	NARS researchers	*Brachiaria* hybrids with resistance to *Rhizoctonia* selected in multilocational trials in LAC and Asia	
OUTPUT 3	Grasses and legumes with adaptation to edaphic and climatic constraints developed	CIAT, ARIS and NARS researchers, seed companies and farmers	New cultivars of *Brachiaria* and legumes with adaptation to low fertility soils, drought and poorly drained soils	Increased livestock/crop production and improved NRM through planting multipurpose forage species adapted to low

	Outputs	Intended User	Outcome	Impact
			released and adopted by farmers in LAC, Asia and Africa	fertility soils, drought and waterlogged soils
Output Targets 2006	Selected a genotype of *Brachiaria* that combines resistance to ate least two species of spittlebug with good adaptation to acid – low fertility soils Genetic variability for nitrification inhibition in the collection (40 accessions) of *Brachiaria humidicola* held by CIAT determined	NARS researchers and seed companies CIAT, ARIS and NARS researchers	A new *Brachiaria* hybrid is made available to NARS partners for field testing in LAC, Africa and Asia Selection for nitrification inhibition incorporated in the Brachiaria improvement programs in LAC	
Output Targets 2007	Screening method for selecting *Brachiaria* genotypes adapted to poorly drained soils developed	CIAT and NARS researchers	New genotypes incorporated into the Brachiaria breeding program to develop cultivars with adaptation to poor soil drainage	
Output Targets 2008	Tradeoff of using drought tolerant legumes as cover crops and dry season feed defined	NARS researcher and farmers	Farmers adopt legumes as green manure and as feed resource for the dry season in LAC and Africa	
OUTPUT 4	Superior and diverse grasses and legumes evaluated in different production systems are disseminated	NARS researchers, development programs and farmers	New cultivars of grasses and legumes with adaptation to biotic and abiotic stresses are adopted by farmers in	Livelihoods of small livestock farmers improved through adoption of forages that result in more efficient use of family

	Outputs	Intended User	Outcome	Impact
			LAC, Africa and Asia	labor and higher income from crop and animal products
Output Targets 2006	Two forage seed delivery systems developed to pilot stage to test linking small seed producers to large company/export market opportunities A superior *Brachiaria* hybrid combining drought tolerance, resistance to spittlebug and adaptation to acid infertile soils released by a commercial seed company in LAC countries	Forage seed companies, development programs and farmers Forage Seed companies, development programs and farmers	Alliance with large seed companies reduces risk and increases income of small farmers engaged in seed multiplication Seed of a superior grass genotype available to small and large farmers in LAC, Asia and Africa	
Output Targets 2007	Elite accessions (5- 10) of shrub legumes (*Flemingia macrophylla* and *Desmodium velutinum*) and short term herbaceous (*Vigna unguiculata, Canavalia brasilensis, Lablab purpureus*) deployed in NARS forage evaluation programs	NARS researchers and development programs	Researchers in LAC, Asia and Africa incorporate into their forage evaluation programs new shrub legume alternatives	

	Outputs	Intended User	Outcome	Impact
Output Targets 2008	A superior *Brachiaria* hybrid with resistance to spittlebug and adaptation to acid soils and drought planted in over 50,000 ha	Small and large farmers	Farmers in LAC, Africa and Asia who adopt new pasture species increase milk and beef production	

CIAT PROJECT IP-6: TROPICAL FRUITS

Project Description

Goal: To work with partners in the public and private sectors who support rural communities by providing them with information and assistance to produce, process, and market tropical fruits, thus increasing wealth and improving welfare of current and future generations in the countryside.

Objective: to provide partners, local agencies and entrepreneurs with the tools, technologies and methodologies that they can use to better select likely products for development and then to successfully produce, process and market them.

Important Assumptions: The Fruit Project in CIAT was established in an organizational structure within which it has to seek support and collaboration assistance from the diverse projects that are the basic work units of the centre. The success of the Fruit Project depends on the degree of collaboration and support from other CIAT projects. This support will depend on sufficient resources being assigned to the Fruits Project for it to reach a critical mass from core resources or through a major special project.
The Fruit Project can only be effective in reaching its goals of improving the welfare and increasing the incomes of rural communities by working with local partners: our success is dependent not only on our efforts but also on being able to find effective partners willing to work with us.
The partners and the rural communities will be responsible for matching production potential of specific communities with high value marketable products: we assume that our local partners, often using information and methodologies developed in this project, will identify suitable matches and exploit them commercially.
Some of the work planned is high-risk-high-pay off research: in any research organization a certain proportion of these high-risk ventures will fail almost by definition. Hence we assume that not all our high-risk ventures will be successful, but we expect to achieve a reasonable batting average.

Target Eco-region: The role of tropical fruits in development is seen as a means of providing improved incomes, directly to small holders, through rural employment and through the development of ancillary industries and services linked to the fruit business. The total income per hectare is much greater than with traditional staples and commodities. Furthermore as many fruits are perennials they fit well into hillside agriculture and areas with heavy rainfall that are not appropriate for many annual crops. The tropical fruits program directs its efforts to areas with a high population density dependent on agriculture, often coupled with hilly terrain or high rainfall.

Beneficiaries and End Users: The immediate beneficiaries and users of the outputs of our work with partners are farmer groups, farmers, entrepreneurs, local research and development organizations, importers/exporters of tropical fruits and any development agencies interested in increasing rural incomes in areas where tropical fruits may have a

role to play. The final end users are the rural communities that are better able to produce, process and market fruits in such a manner that they improve their own incomes and welfare and also those of future generations.

Collaborators: Fruit gatherers and producers, national and international research and development agencies, developed and developing country universities, IPGRI, ICRAF, Max Planck Institute, Univ. Florida, CORPOICA, MADR, Corporación Biotec, Universidad Catolica del Oriente (Colombia).

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	0.360	0.354	0.352	0.354	0.345

CIAT PROJECT IP-6: TROPICAL FRUITS (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Interactive Web-based information system in place to determine which tropical fruits can grow successfully in a given place: *Homologue*-What to Grow Where.	Farmer groups, research agencies, development agencies, and entrepreneurs	Rural communities identifying the best options for producing high value products in their own particular niche	Rural communities producing high value products well adapted to their particular ecological conditions
Output Targets 2006	Beta version of *homologue* with climate factors	Farmer groups, research agencies, development agencies, and entrepreneurs	Rural communities identifying areas similar to theirs for low risk technology and germplasm transfer	
Output Targets 2008	Neotropical fruits data base linked to *homologue* with soils analysis capacity	*Homologue* users	Rapid identification of production options for any particular site	
OUTPUT 2	Selection, propagation and targeting methodologies for tropical fruits	Local research and development agencies and farmers groups	Producers planting uniform quality elite fruit materials, selected from existing natural variation, well adapted to specific ecological conditions on their farms.	Increased rural income through increased production of high value readily marketed products

	Outputs	Intended User	Outcome	Impact
Output Targets 2006	Methodology for clonal propagation of soursop (model crop) at local nursery level.	Fruit tree nurseries	Availability of clean planting material of elite clones well adapted to specific local conditions	
Output Targets 2007	Methodology for participatory selection of high value perennial fruit species (based on model crops of sour sop and lulo)	Local research and development agencies and farmers groups	Producers selecting and propagating elite materials	
Output Targets 2008	Baseline methodologies for clonal propagation of woody perennials	Local research agencies	Propagation methodologies adapted to individual species (or clones) of local interest	

CIAT – RESEARCH FOR DEVELOPMENT CHALLENGE II. IMPROVING MANAGEMENT OF AGROECOSYSTEMS IN THE TROPICS

RCII Overview: Improving management of agroecosystems in the tropics

Goal: To improve food security, economic productivity and agroecosystem and human health in the tropics while ensuring the provision of global environmental goods and services.

Objective: To contribute with technical, institutional, and policy innovations for the improved management of tropical agroecosystems that benefit poor communities and the local and global environment.

Important Assumptions: Donor support; shared vision; political will; local expertise; receptiveness for innovation and learning; addressing complexity, risk, uncertainty and vulnerability; active participation from NARS; active collaboration from IARCs, ARIs, regional consortia, NGOs and GOs; security and political instability does not restrict access to target sites and continuation of on-going activities; extreme climatic conditions do not lead to agroecosystem disruption.

Target Ecoregions: East and Central African highlands (Kenya, Uganda, Ethiopia, Tanzania, Rwanda, DR Congo); Southern African savannas (Zimbabwe, Malawi, Mozambique, Zambia); West African region (Burkina Faso, Niger, Cote d'Ivoire, Nigeria, Benin, Togo, Mali, Senegal, Ghana); Central American hillsides (Honduras, Nicaragua); Andean hillsides (Colombia, Ecuador, Peru; Bolivia); Tropical savannas of south America (Colombia, Venezuela); Amazon rainforest (Brazil, Colombia, Peru); Semi-arid agroecosystems of South America (Brazil, Colombia); Humid, subhumid and semiarid agroecosystems of Southeast Asia (Cambodia, Southern China, Indonesia, Lao PDR, the Phillippines, Thailand, Vietnam).

Beneficiaries and End Users: Principally small-scale crop-livestock farmers and extension workers, local and regional associations and consortia, national and regional universities, NGO's, GOs, and NARES in tropical agroecosystems of sub-Saharan Africa, Latin America and South-east Asia.

Collaborators: NARES, IARCs, ARIs, Universities, Regional consortia, NGOs, GOs. Please refer to the detailed lists presented by PE-1, PE-2, PE-3 and PE-4 projects.

RDC Changes: Research for development challenge logframe has been aligned to support goals of Millennium development, Millennium Ecosystem Assessment and CGIAR.

CIAT – RESEARCH FOR DEVELOPMENT CHALLENGE II. IMPROVING MANAGEMENT OF AGROECOSYSTEMS IN THE TROPICS (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1 PE-1: Crop and Agroecosystem Health Management	Pest-and-disease knowledge and management systems developed and transferred for sustainable productivity and healthier agroecosystems in the tropics	NARS and university researchers, extension workers, CIAT and CGIAR scientists, NGOs, farmers, policy makers	New options available for partners on disease and pest management and plant health enhancement; Molecular and conventional tools available for partners on pathogen and insect pest characterization; Enhanced capacity of partners for disease and pest diagnosis and management.	Minimized crop failures and improved agroecosystem health increase agricultural productivity and sustainability and contribute to improved livelihoods
OUTPUT 2 PE-2: Integrated Soil Fertility Management (TSBF-CIAT)	Profitable, socially-beneficial and resilient agricultural production systems developed based on Integrated Soil Fertility Management (ISFM)	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, policy makers and global conservation organizations	Soil-related national institutions linked to TSBF-CIAT networks with their scientists engaged in TSBF-inspired topics; Extension agencies and/or NGOs take up TSBF-CIAT outputs to apply in their work programs; Farmers' organisations and/or civil society apply TSBF outputs in their plans and work; TSBF-CIAT scientists lead globally-funded research on at least three topics of key relevance to the international community (as identified in GEF, MDG, MEA, CGIAR mission and goal statements)	Resilient production systems contribute to food security, income generation and health of farmers

	Outputs	Intended User	Outcome	Impact
OUTPUT 3 PE-3: Communities and Watersheds	Methodologies developed for improved watershed management based on community-based systems of monitoring and management of watershed characteristics and processes	Local organizations, water user associations, decision makers at local / district level; National research and monitoring organizations; National / international scientists	Improved watershed management and resource (water) allocation methodologies available to partners	Better health and livelihoods for farmers, while enhancing ecosystem integrity resulting from improved management of water quantity and quality by communities at the watershed level
OUTPUT 4 PE-4: Geographical Information and Land Use Change	High quality land use information and information products derived from spatial analyses that enable better decisions about agricultural land use change and its consequences	Policy-makers, decision-makers (including farmers and their associations) at local, municipal and national level	Decision makers understand consequences of land use that provides them the certainty about land use change decisions that leads to progressive improvement of productivity with reduced risk of resource degradation	Adoption of sustainable land management practices across spatial scales and decision-making levels leads to significant decrease in land degradation

CIAT PROJECT PE-1: CROP AND AGROECOSYSTEM HEALTH MANAGEMENT

Project Description

Goal: Enhance crop yields and quality of products, reduce pesticide use and residue, and improve agro-ecosystem health through enhancement of soil health and integrated management of major pests and diseases in the tropics.

Objective: Develop and transfer pest-and-disease management knowledge and manage complex cropping systems for sustainable productivity and healthier agro-ecosystems in the tropics.

Important Assumptions: 1) Donor support to projects; 2) Active collaboration from IARCs and other research organizations; 3) Active collaboration from CIAT's projects (e.g. TSBF); 4) Active participation from NARS.

Target Ecoregion: Humid and sub-humid tropics in sub-Saharan Africa, South-East Asia, Central America, Caribbean and Andean regions.

Beneficiaries and End Users: Information on biodiversity in tropical agroecosystems, improved IPM components and technologies and knowledge systems will benefit NARS, IARCs, NGOs, farmers and consumers, by increasing crop yields, crop quality, human and agro-ecosystem health and stabilizing production systems.

Collaborators: International Agricultural Centers through the System wide program on Integrated Disease and Pest Management, NARS Latin America (eg. CORPOICA, Colombia; EMBRAPA, Brazil; INIFAP, Mexico; DICTA, Honduras) and Africa (e.g.NARO, Uganda; EARO, Ethiopia; ISAR, Rwanda), universities (eg. Cornell, University of Kentucky, Kansas State University, University of Florida, Universidad Nacional, Universidad Valle, Alemaya, Makerere and Nairobi Universities, U. Nacional de Costa Rica, etc.), private sector (eg. BioTropico, ASCOFLORES) NGOs (eg. Manrecur)

Project changes: The Integrated Pest and Disease Management project has made the following changes in 2005:

Previous Project Name: Integrated Disease and Pest Management
Comment: The various activities and outcomes of the project focus not only on crop health in general through host resistance, conservation and utilization of natural resources (such as natural enemies and other biocontrol agents, plant- and microbial-derived biopesticides), judicious use of pesticides, and other novel strategies of disease and pest management, but also on general soil health. These measures in turn contribute to agroecosystem health (human, wildlife, soil, water, beneficial organisms, etc.) due to reduction in indiscriminate use of pesticides. Not only increased crop yields are achieved, but also enhanced quality of products (eg. products with low or no pesticide residues) that benefit producers and

consumers; and healthier environment can result from development and implementation of environmentally-friendly disease and pest management strategies.

New Project Name: Crop and Agroecosystem Health Management

Previous Goal: To increase crop yields and reduce environmental contamination through the effective management of major pests and diseases.

Comment: The project will also focus on strategies to enhance soil health (developing strong ties with TSBF-CIAT), host resistance, biopesticides and other novel methods of disease and pest management strategies in order to enhance crop yields and quality of products, as well as improve agro ecosystem health in general. We will seek to apply environmentally-friendly disease and pest management strategies to non-CIAT commodities in the tropics, particularly to African crops. Because we have over the years developed many tools and methods for disease and pest diagnosis, detection, control strategies mainly on CIAT commodities, great efforts would be made to apply these technologies to crops such as fruits, vegetables and other high value crops. We plan to explore ways of enhancing incomes of small producers through products with little or no pesticide residues (eg. organic farming).

New Goal: To enhance crop yields and quality of products, reduce pesticide use and residue, and improve agro-ecosystem health through enhancement of soil health and integrated management of major pests and diseases in the tropics.

Previous Output 3: NARS' capacity to design and execute IPM research and implementation strengthened.

Comment: Many of the project scientists and their support staff are well-trained molecular biologists who develop and apply various molecular tools for the detection, characterization and diagnosis of pests and diseases; clone genes from various organisms, sequence genomes of organisms, apply recombinant DNA and transgenic technologies for disease and pest management, as well as train various NARS scientists and students in molecular tools and procedures. Therefore, capacity building of NARS in these important areas of research (which are in demand particularly in Africa) is added to this output.

New Output 3: NARS' capacity to design and execute IPM research and implementation, and applications of molecular tools for pathogen and pest detection, diagnosis, diversity studies as well as novel disease and pest management strategies strengthened.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	1.699	1.565	1.553	1.561	1.524

CIAT PROJECT PE-1: CROP AND AGROECOSYSTEM HEALTH MANAGEMENT (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Pest and pathogen complexes in key crops described and analyzed.	NARIs, universities, NGOs, IARCs	Molecular and conventional tools for disease and pest diagnosis, detection and characterization developed, evaluated and disseminated to researchers.	Improved crop productivity from more efficient and accurate tools for disease and pest diagnosis, and cost-effective disease and insect pest management strategies.
Output Targets 2006	Invasive pest species, white grub, burrower bugs and their natural enemies taxonomically identified and characterized	NARIs researchers in LAC, Asia and Africa, IARCs	Microbial and insect pest characterization tools developed and utilized by researchers.	
Output Targets 2007	Molecular tools for detection, diagnosis and diversity studies of key pathogens and pests of CIAT commodities made available	NARIs researchers in LAC, Asia and Africa, IARCs	Disease and pest characterization tools developed and adopted by researchers.	
Output Targets 2008	Two plant- growth promoting bacteria and one biological control agent characterized.	NARIs researchers in LAC, Asia and Africa	New options for disease and pest management and plant health enhancement developed and tested by researchers.	
OUTPUT 2	Pest-and-disease management components and strategies developed for key crops.	Researchers in LAC, Asia and Africa	Integrated disease and pest management strategies developed and adopted by farmers.	Increased and stable income of small farmers through increased crop yields and enhanced quality of products
Output Targets 2006	Bean, cassava, rice and tropical forage lines resistant to major diseases	Researchers in LAC, Asia and Africa;	New crop genotypes with resistance to important pests and diseases incorporated	

	Outputs	Intended User	Outcome	Impact
	and pests and molecular markers associated with some of these resistance genes identified.		into existing breeding programs to develop cultivars with high levels and durable resistance.	
Output Targets 2007	At least 2 *Brachiaria* genotypes with spittlebug resistance, a whitefly resistant cassava variety, and 50 blast and sheath blight resistant rice lines developed.	Researchers in LAC, Asia and Africa; CIAT scientists; farmers	Selected genotypes of *Brachiaria,* cassava and rice tested for resistance to insects and pathogens in different regions.	
Output Targets 2008	Three biological pesticides, and angular leaf spot and *Pythium* resistant bean varieties made available	Researchers in LAC, Asia and Africa; farmers	Disease /pest resistant crops developed and adopted; biopesticides formulated and adopted.	
OUTPUT 3	Strengthened capacity of NARS to design and execute IPM R&D, to apply molecular tools for pathogen and pest detection, diagnosis, diversity studies and to device novel disease and pest management strategies	NARIs in LAC, Asia and Africa; farmers	Improved capacity of NARS partners to disseminate to farmers disease and pest management strategies	More income to farmers by using; environmentally-friendly disease and pest management strategies.
Output Targets 2006	Use biopesticides and other pest management practices on common bean crop transferred to farmers in Malawi, Kenya,Tanzania and Uganda	NARIs and farmers in Africa	Options for disease and pest management strategies tested and adopted.	

	Outputs	Intended User	Outcome	Impact
Output Targets 2007	Management of soil-borne pests (white grubs and burrowers bugs) on cassava, maize and onion evaluated with farmers	NARIs and farmers in LAC, Africa	Soil pest management methods adopted by farmers.	
Output Targets 2008	Combination of whitefly resistant cassava varieties and biological control agents made available to farmers	NARIs, NGOs and farmers	Improved cassava varieties together with improved disease and pest management practices adopted.	
OUTPUT 4	Global IPM networks (Integrated Whitefly Management Technology) and knowledge systems developed.	NARIs, Universities, NGOs, IARCs, farmers	Sustainable food and cash crop production systems with reduced environmental impact and production costs adopted.	Improved livelihoods, rural and urban health standards, and increased farm/household income
Output Targets 2006	Guidelines and technical information on whitefly management distributed in Asia, Africa and Latin America	NARIs, Universities, NGOs, IARCs, farmers	Information on effective whitefly/virus control practices made available in all affected countries.	
Output Targets 2007	Farmer participatory research conducted in selected pilot sites of sub-Saharan Africa, S.E. Asia and Latin America.	NARIs, Universities, NGOs, IARCs, farmers	Methods in lower pesticide use resulting in lower production costs and environmental contamination adopted.	
Output Targets 2008	Impact Assessment and Policy guidelines implemented for the benefit of farmers.	Government Institutions, NARs, NGOs, farmers	Food production and income-generating strategies for small-scale farmers facilitated by official decrees	

CIAT PROJECT PE-2: TROPICAL SOIL BIOLOGY AND FERTILITY (TSBF) INSTITUTE

Project Description

Goal: To strengthen national and international **capacity** to manage tropical ecosystems sustainably for human well-being, with a particular focus on soil, biodiversity and primary production; to reduce **hunger and poverty** in the tropical areas of Africa and Latin America through scientific research leading to new technology and knowledge; and to ensure **environmental sustainability** through research on the biology and fertility of tropical soils, targeted interventions, building scientific capability and contributions to policy.

Objective: To support the livelihoods of people reliant on agriculture by developing profitable, socially-just and resilient agricultural **production systems** based on Integrated Soil Fertility Management (ISFM); to develop **Sustainable Land Management** (SLM) in tropical areas of Africa and Latin America through reversing land degradation; and to build the **human and social capital** of all TSBF-CIAT stakeholders for research and management on the sustainable use of tropical soils.

External Conditions: Security and political stability does not restrict access to target sites and continuation of on-going activities.

Important Assumptions: Poverty reduction strategies remain central to human development support and funding. TSBF stakeholders remain engaged with TSBF-CIAT strategic priorities and/or TSBF management continues to adapt and innovate in response to changing priorities. Funding for research on globally-important issues continues.

Target Ecoregions: East and Central African highlands (Kenya, Uganda, Ethiopia, Tanzania, Rwanda, DR Congo); Southern African savannas (Zimbabwe, Malawi, Mozambique, Zambia); West African region (Burkina Faso, Niger, Cote d'Ivoire, Nigeria, Benin, Togo, Mali, Senegal, Ghana); Central American hillsides (Honduras, Nicaragua); Andean hillsides (Colombia, Ecuador, Peru; Bolivia); Tropical savannas of south America (Colombia, Venezuela); Amazon rainforest (Brazil, Colombia, Peru).

Beneficiaries and End Users: Principally small-scale crop-livestock farmers and extension workers, NGO's and NARES in tropical agroecosystems of sub-Saharan Africa, Latin America and South-east Asia.

Collaborators: ***NARES:*** KARI (Kenya), DRSRS (Kenya), NMK (Kenya), KEFRI (Kenya), NARO (Uganda), NFA (Uganda), NEMA (Uganda), MOA (Uganda), ITRA (Togo), INRAB (Benin), SRI (Ghana), IER (Mali), IAR (Nigeria), INRAN (Niger), INERA (Burkina Faso); CORPOICA (Colombia), EMBRAPA (Brazil), Kerala Forest Research Institute (India), GBP Institute (India), SDREP (India), INTA (Nicaragua), DICTA (Honduras); IC-SEA BIOTROP (Indonesia), RIABGR (Indonesia), FNCRDC (Indonesia), FNCRDC (Indonesia), RRIEC (Indonesia), COSA (Indonesia), IOS (Cote d'Ivoire), ANADER (Cote d'Ivoire), NRMEE (Cote d'Ivoire), MOE (Cote d'Ivoire), INPDMDS (Cote d'Ivoire), ESDA (Cote d'Ivoire), UCA (Cote d'Ivoire), UAA (Cote d'Ivoire), BNETD/CCT (Cote d'Ivoire), CNRA (Cote d'Ivoire), (Instituto de Ecologia (Mexico), IEAC (Mexico), UNAM (Mexico), IFCP

(Mexico), Centro Exp. Andres (Mexico), Reserve de la Biosfera de Los Tuxtlas (Mexico), ***ARIs:*** CIMMYT, ILRI, CIP, IFDC, ICRAF, IITA, ICRISAT, IRD (France), CIRAD (France), ETHZ (Switzerland), JIRCAS (Japan); ***Universities:*** Nacional (Colombia), UNA (Nicaragua), UNA and EAP Zamorano (Honduras), Uberlandia (Brasil), University of Nairobi (Kenya), USIU (Kenya) Maseno University (Kenya), Methodist University (Kenya), Makerere University (Uganda), Kenyatta University (Kenya), Zimbabwe (Zimbabwe), Sokoine (Tanzania), Universidade Federal de Lavras (Brazil), Universidade Regionale de Lavras-FURB (Brasil), INPA (Brasil), UFAM (Brasil), Universidade De Brasilia (Brasil), Jawaharlal Nehru University (India), University of Agricultural Sciences (India), Kumaon University (India), Sambalpur University (India), Universitas Lampung (Indonesia), Brawijaya University (Indonesia), Gadjah Mada University (Indonesia), Bogor Agricultural University (Indonesia), Université de Cocody (Cote d'Ivoire), Universite D'Adobo-Adame (Cote d'Ivoire), Universidade Veracruziana (Mexico), Instituto Polytecnico (mexico), Leuven (Belgium), Paris (France), Bayreuth and Hohenheim (Germany), SLU (Sweden), NAU (Norway), Cornell (USA), Wisconsin-Madison (USA), Ohio State (USA), Colorado State University (USA), East Anglia (UK), Queen Mary University (USA), Michigan State University (USA), ITC (The Netherlands) University of Exeter (UK), and Wageningen University and Research Centre (Netherlands). ***Regional Consortia:*** AFNET, MIS, CONDESAN; ***NGOs:*** CARE, World Vision; CIPASLA, CIPAV.

Project Changes: TSBF-CIAT has developed and published a document on strategy and work plan for 2005-2010. CIAT activities of the Systemwide Program on SWNM are incorporated. Project logframe has been aligned to support goals of MDG, MEA and CGIAR Science Council priorities.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	6.166	5.424	5.380	5.410	5.282

CIAT PROJECT PE-2: TROPICAL SOIL BIOLOGY AND FERTILITY (TSBF) INSTITUTE (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Biophysical and socioeconomic processes understood, principles, concepts and methods developed for protecting and improving the health and fertility of soils	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Principles, concepts and methods inform technology and system development	Improved soil health and fertility contribute to resilient production systems and sustainable agriculture
Output Targets 2006	Impact of three contrasting cropping systems on productivity and nutrient dynamics in hillsides and savannas quantified	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Partners testing the promising production systems	
	Standard methods for BGBD (belowground biodiversity) inventory published	CGIAR, ARIs, researchers from NARS and local universities, regional consortia	Partners and other global scientists using standard methods for BGBD inventory	
	At least three indicators of soil health and fertility at plot, farm and landscape scales in hillsides of Africa identified	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Partners begin validating indicators of soil health and fertility	
Output Targets 2007	At least three indicators of soil health and fertility at plot, farm and landscape scales in acid soil savannas identified	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Partners begin validating indicators of soil health and fertility	
	Land use intensity impact on BGBD evaluated in seven tropical countries participating in the BGBD project	Scientists participating in the BGBD project, ARIs, CGIAR, researchers from NARS and local universities, and farmers	Links between BGBD and land use management established and used as basis for developing sustainability in tropical farming systems	

	Outputs	Intended User	Outcome	Impact
	At least two indicators of soil quality used for farmer's decision making in hillsides agroecosystem;	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Partners incorporate farmer decision making in new proposals and on–going activities	
Output Targets 2008	Practical methods for rapid assessment and monitoring of soil resource base status developed	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Partners are using the methods with farmers	
	The social, gender, and livelihood constraints and priorities affecting the sustainable use of soils have been identified, characterized, and documented through case studies using innovative methods	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Partners are working to overcome the identified constraints with new proposals and on-going research	
OUTPUT 2	Economically viable and environmentally sound soil, water, and nutrient management practices developed and tested by applying and integrating knowledge of biophysical, socio-cultural and economic processes	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Technologies, systems and soil management strategies \adopted and adapted through partnerships	Adapted technologies contribute to food security, income generation and health of farmers
Output Targets 2006	Decision support framework for ISFM developed, tested with and made available to stakeholders in at least two benchmark countries in Africa	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Partners incorporating the DSS in new proposals and on-going research efforts	

	Outputs	Intended User	Outcome	Impact
	Cereal-legumes and livestock systems, with nutrient use efficiency as an entry point, tested and adapted to farmer circumstances in hillsides of Africa	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Cereal-legume systems and soil management strategies adopted and adapted through partnerships	
Output Targets 2007	Banana, bean and cassava-based systems, with the relation between pest, diseases and ISFM as entry point, including novel cropping sequences, tested and adapted to farmer circumstances in Africa	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Banana, bean and cassava-based systems and soil management strategies adopted and adapted through partnerships	
	Cereal-legumes and livestock systems, with nutrient use efficiency as an entry point, tested and adapted to farmer circumstances in acid soil savannas	CGIAR, ARI, researchers from NARS and local universities	Cereal-legume systems and soil management strategies adopted and adapted through partnerships	
Output Targets 2008	Communities in at least three countries demonstrate and test direct or indirect management options that enhance locally important ecosystem services using BGBD	BGBD network, CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, policy makers and global conservation organizations	Researchers, farmers, land users and policy makers and global conservation organizations increase their awareness of the benefits of conserving and managing BGBD	

	Outputs	Intended User	Outcome	Impact
	Quesungual and other related agroforestry systems, with soil and water conservation as entry point, including crop diversification strategies, tested and adapted to farmer circumstances in Central America	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, and regional consortia	Quesungual system and soil management strategies adopted and adapted through partnerships	
OUTPUT 3	Partnerships and tools developed and capacity enhanced of all stakeholders for improving the health and fertility of soils	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	Strengthened and expanded partnerships for ISFM facilitate south-south exchange of knowledge and technologies	Improved institutional capacity in aspects related to ISFM and SLM in the tropics contribute to agricultural and environmental sustainability
Output Targets 2006	At least two capacity building courses on ISFM held	AfNet, MIS	Partners incorporating new knowledge and skills in new proposals and on-going research efforts	
	At least five capacity building courses on BGBD held at the global level and more at participating country level	BGBD partners, researchers, local universities and NGOs	Partners incorporating new knowledge on BGBD and skills in new proposals and on-going research efforts	

	Outputs	Intended User	Outcome	Impact
Output Targets 2007	Strategy for building capacity for SLM is developed with partners	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	TSBF-CIAT scientists and partners lead globally-funded research on at least three topics of key relevance to the international community (as identified in GEF, MDG, MEA, CGIAR mission and goal statements)	
	At least three capacity building courses on ISFM held by AfNet and MIS	AfNet, MIS	Partners incorporating new knowledge and skills in new proposals and on-going research efforts	
	Books, web content and papers produced by partners in BGBD project both north and south in seven tropical countries	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	Partners incorporating new knowledge and skills in new proposals and on-going research efforts	
Output Targets 2008	Farmer-to farmer knowledge sharing and extension through organized field trips and research activities result practices in at least two sites	Researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	Farmers realize benefits of knowledge sharing	
	Web content in the BGBD website enhanced to contain data and information on BGBD taxonomy and species identification	Researchers, CGIAR, ARI, local universities	Increased number of biodiversity scientists use the website for proper identification and classification of soil biota to species level	

	Outputs	Intended User	Outcome	Impact
OUTPUT 4	Improved rural livelihoods through sustainable, profitable, diverse and intensive agricultural production systems	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	Partners promoting resilient production systems with multiple benefits (food security, income, human health and environmental services)	Improved resilience of production systems contribute to food security, income generation and health of farmers
Output Targets 2006	Components of improved systems promoted by partners in African hillsides	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	Farmers adopting improved system components, including crops and soil management technologies	
	Strategies for BGBD management tested by partners and farmers in seven tropical countries participating in the BGBD project	Researchers from NARS, local universities and farmers	BGBD and land use management strategies that enhance crop yields and ecosystem services produced and documented	
Output Targets 2007	Components of improved systems promoted by partners in acid soil savannas	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers	Farmers adopting improved system components, including crops and soil management technologies	
	Crop-livestock systems with triple benefits tested and adapted to farmer circumstances in hillsides	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	Farmers are testing and adapting improved production systems in at least 15 sites across five countries	

	Outputs	Intended User	Outcome	Impact
	Strategies of BGBD management for crop yield enhancement, disease control, and other environmental services demonstrated in seven tropical countries participating in the BGBD project	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	Farmers and governments adopting BGBD technologies in crop production and ecosystems services	
Output Targets 2008	Improved production systems having multiple benefits of food security, income, human health and environmental services identified	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	Market-led hypothesis is incorporated in systems experimentation; Different partners linking food security, environmental sustainability and income generation to health	
	Crop-livestock systems with triple benefits tested and adapted to farmer circumstances in savannas	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	Farmers are testing and adapting improved production systems in at least 15 sites across five countries	
OUTPUT 5	Options for sustainable land management (SLM) for social profitability developed, with special emphasis on reversing land degradation	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, young professionals, policy makers	Principles of sustainable land management integrated in country policies and programs	Reversing land degradation contribute to global SLM priorities and goals
Output Targets 2006	Potential for carbon sequestration estimated for at least one tropical agroecoregion	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, policy makers	Regional governments develop CDM projects based on the knowledge of carbon sequestration potential	

	Outputs	Intended User	Outcome	Impact
	Economic valuation of legume nodulating bacteria and soil structure carried out in at least five countries participating in the BGBD project	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, policy makers	Visibility of BGBD economic viability and BGBD technologies appreciated and used by farmers, and disseminated by local, national and regional governments	
Output Targets 2007	Decision tools (GEOSOIL; Decision Tree) available for land use planning and targeting production systems in acid soil savannas	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, policy makers	Local organizations using the decision tools for land use planning	
	Biophysical, social and policy niches in the landscape for targeting SLM technologies and enhanced ecosystem services identified and prioritized	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, policy makers	Methods of SLM are incorporated in the design of landscape research	
Output Targets 2008	Methods for socio-cultural and economic valuation of ecosystem services developed and applied for trade-off and policy analysis used in at least in 2 humid and 2 sub-humid agroecological zones	CGIAR, ARI, researchers from NARS and local universities, BGBD network, NGOs, farmers, regional consortia, policy makers	Methods of SLM are incorporated in the design and evaluation of landscape research	
	In at least four of the countries participating in the BGBD project, policy stimulated to include matters related to BGBD management, and sustainable utilization.	CGIAR, ARI, researchers from NARS and local universities, NGOs, farmers, regional consortia, policy makers	Policy issues related to BGBD acquisition, exchange, intellectual property rights (IPR), benefits sharing, etc. included in local, national and regional government policies	

CIAT PROJECT PE-3: COMMUNITIES AND WATERSHEDS

Project Description

Goal: To improve water, food and environmental quality and services through research on land-water-community interactions.

Objective: To strengthen local processes of watershed management and sustainable agricultural development in tropical regions based on the experiences of NRM at research watersheds.

Important Assumptions:

- Environmental, social, economic and political conditions are maintained on a macro level
- Local and regional partners continue project-related activities
- Donor interest in and support of project objectives
- Institutional linkages maintained

Beneficiaries and End Users:

Primary clients:	local governments, local organizations, farmer groups, water user associations
Secondary clients:	research institutions, national governments, NGOs
Final beneficiaries:	farmers and communities.

Collaborators

CGIAR: IWMI, Water and Food CP; CIP

Universities: CATIE (Costa Rica), de la Paz (Costa Rica), UBC (Canada), National Agraria (Nicaragua and Honduras), CIRA-UNAN (Nicaragua), CINARA-U. del Valle (Colombia), del Quindío (Colombia), Tecnológica de Pereira (Colombia), INTEP (Colombia), Swiss College of Agriculture

NGO: CGIAB (Bolivia), Randi Randi (Ecuador), ASOBOLO (Colombia), Clodest (Honduras), FIPAH (Honduras), CARE (Nicaragua and Honduras)

GO: CRQ, CVC (Colombia), SENA (Colombia), INTA (Nicaragua), MARENA (Nicaragua), Municipalities of El Dovio (Colombia), Yorito (Honduras), and San Dionisio (Nicaragua)

Local associations: Herederos del Planeta (El Dovio, Colombia), Asociación Campos Verdes and CIALs (San Dionisio, Nicaragua)

National and Regional associations: CONDESAN, RENOC (Nicaragua), CONCORD (Americas)

International research organizations: INIA (Spain); United Nations University, UNU-INWEH

CIAT: Soils (PE-2), Land Use (PE-4), Forages (IP-5), Agroenterprises (SN-1)

Explanation of any Project changes (with respect to previous MTPs): Based on comments received from the BOT Program Committee, we have combined outputs 2 and 3 from our 2005-2007 log frame. Output 4 (previously output 5) has been modified to include

implementation, documentation and analysis as suggested and the information dissemination component of output 3 moved to this section. Additional detail has been added to the output targets (previous milestones) to clarify the role of production systems and sustainable agriculture, and to include activities with partners as an output target of capacity building.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	2.061	1.952	1.936	1.947	1.901

CIAT PROJECT PE-3: COMMUNITIES AND WATERSHEDS (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Methodologies for the development of community-based systems of monitoring and management of watershed characteristics and processes for improving land-water management (5-7 years)	Farmers and local organizations; decision makers at the local / district level; national research organizations	Improved watershed management based on knowledge of land-water interactions, production systems and land use. Data used in national monitoring programs	Improved water quality management by communities at the local level and associated implications for human and ecosystem health.
Output Targets 2006	Monitoring networks fully established and baseline water, land and resource use surveys conducted and analyzed in pilot watersheds	Water user associations, district level government	Data on water quality available to user associations	
Output Targets 2007	Continuation of water quantity and quality monitoring within reference watersheds; Assessment of land use / production system impacts on water quantity and quality in pilot watersheds including adaptation of UBC Environmental Area Assessment method to Latin America	Water user associations, district level government, national monitoring agencies, national research / government institutions	Data on water quantity and quality supplied to local users and regional authorities	
Output Targets 2008	Continued monitoring, assessment of production system sustainability with respect to water (quantity	Decision makers at the district level, national research / government institutions	Data on water quantity and quality linked to national monitoring networks; hot spot analysis based on	

	Outputs	Intended User	Outcome	Impact
	and quality) and evaluation of modified ESA method (initiated in 2007)		ESSA method	
OUTPUT 2	Methodologies for increasing the equity of highland-lowland water allocation including the provision of environmental services (7-10 years)	Water user associations, decision makers at municipal, national, and regional levels	More equitable highland-lowland resource (water) allocation including the provision of environmental services	Enhanced livelihoods while preserving ecological flow as a result of education programs and water policy implementation for equitable water allocation and use efficiency
Output Targets 2006	Continuation of water availability / hydrologic response research initiated in 2005, measurement of water use by sector, assessment of water efficient technologies monitored in 2005 and compilation of regulatory framework for water in pilot watersheds	Water user associations, decision makers at municipal and regional levels, strategic project partners	Available options for water efficient technologies relative to local conditions	
Output Targets 2007	Completion of wetland hydrometric response assessment (Colombia), evaluation of collaboration mechanisms for water allocation, assessment of regulatory impact on water use and allocation for Latin America, and initiation of water wise programs	Water user associations, decision makers at municipal and regional levels, local organizations, regional project partners	Collaboration between water user associations (small and large); Understanding of regulatory (legal) framework implications for water use and allocation	
Output Targets 2008	Assessment of headwater protection, rehabilitation	Decision makers at municipal, regional and	Improved headwater management; Improved	

	Outputs	Intended User	Outcome	Impact
	and management measures based on hydrometric and regulatory analysis (2007) and adoption and replication of water efficient technologies and water wise methods	national levels, local organizations, NGOs, research institutions	decision making in water allocation; Structural and behaviouraloptions for water use made available.	
OUTPUT 3	Methodologies for strengthening community capacity for water resource management and allocation (5-10 years)	Local organizations and institutions; regional partners	Strengthened organizations: community and institutional capacity building	A mix of diversified, productive and natural landscapes resulting from initiatives, decisions, and adaptations of strengthened local organizations and institutions
Output Targets 2006	Workshops and training conducted to support research initiatives and internship projects	Local organizations and institutions; user associations, strategic project partners	Enhanced capacity at the local level; Multiple operational partnerships; implementation of inter-institutional collaboration mechanisms	
Output Targets 2007	Joint workshops held with strategic partners / institutions in support of research	Local organizations and institutions; user associations, regional project partners	Enhanced capacity of multiple operational partnerships for water resource management at the local, national, and regional levels	
Output Targets 2008	Comparative analysis of capacity of partners / institutions associated with the project versus comparable groups	National governments, national and international research institutions, donors	Better collaboration between stakeholders (small to large); National and regional network of comparative watersheds	

	Outputs	Intended User	Outcome	Impact
OUTPUT 4	Information systems available to multiple audiences in multi-formats	Regional project partners, research institutions, NGOs	Reaching audiences beyond direct project sites / partners	Multiple watersheds with improved water, food, and environmental quality as a consequence of replicating research results
Output Targets 2006	Websites, CD-ROMs, guides and scientific papers of project results and methods in English and Spanish	Strategic project partners		
Output Targets 2007	Updated websites and CD-ROMs of project activities and impacts; scientific papers	Regional project partners, NGOs, national research institutions		
Output Targets 2008	Updated and new project results disseminated using ICTs; scientific papers	Regional project partners, NGOs, national and international research institutions, government organizations		

CIAT PROJECT PE-4: GEOGRAPHICAL INFORMATION AND LAND USE CHANGE

Project Description

Goal: To support agricultural development by providing geographical information that is novel, significant and actionable and thereby describes and reduces the risks that impede agricultural development in the tropics.

Objective: To provide high quality spatial information that enables better decisions[1] about agricultural land use change. Such information is derived from analyses at the local, regional and global scale and provided to individual farmers or the associations and organizations that work with and for them.

The project focuses specifically on generation, provision and analyses of information about:
(i) Agro-biodiversity related to income generation and genetic resource conservation;
(ii) Natural and socio-economic resources related to agricultural water management; and
(iii) Development and governance of supply chains for higher value agricultural products.

Important Assumptions: Uncertainty significantly obstructs taking better land use decisions at a range of geographical scales. This uncertainty is introduced at least partially by unexplained spatial and temporal variation in natural, cultural and socio-economic resources. Relevant geographical information that explains and thereby clarifies the impact of variation on decision outcomes can be generated in a cost-effective manner.

Target Ecoregion: Ecoregions coincide with those of CIAT projects and external collaborators that PE4 supports with geographical analyses. Currently these target eco-regions include the tropical areas of South and Central America, Eastern and Southeastern Africa, and Southeast Asia.

Beneficiaries and End Users: Fellow researchers within CIAT and other partner organizations, individual farmers and decision makers in the organizations that work with and for farmers in the target ecoregions.

Collaborators: CIAT Projects Tropical Fruits, Tropical Forages, Agrobiodiversity, Beans, Soils-TSBF, CIAT Rural Innovation Institute, CIAT in Asia, CIAT in Africa; Water and Food Challenge Program and its partners, IPGRI, ILRI, CIRAD, World Bank; Universities McGill (Canada), Bonn (Germany), Pescara (Italy), BOKU (Austria), Imperial College London (UK) and Curtin (Australia); von Humboldt Institute (Colombia); various NARS, GOs, NGOs and producers' associations in the target ecoregions.

Explanation of any Project changes: The outputs and output targets have been modified from those listed in the 2005-2007 MTP (submitted September 2003) as they implement

[1] A 'better' decision is one that improves the well-being of stakeholders through the effective management of agricultural land resources. Such decisions are evident in individual or collective action, policies and investments. Sound decisions for change are essential to reverse the downward spiral of poverty and to conserve and improve the natural and socio-cultural resource base.

recommendations from the CCER (November 2003). These changes align PE4's project agenda to CIAT's development challenges. Currently, a new strategic project and business plan is being developed.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	1.558	1.636	1.623	1.632	1.593

CIAT PROJECT PE-4: GEOGRAPHICAL INFORMATION AND LAND USE CHANGE (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Baseline data of land use, climate, poverty, terrain and other variables that permit the description of the status of agricultural development in target ecoregions.	Researchers internal and external to CIAT, agricultural decision makers in Asia, Africa and Latin America.	Realistic, and accurate description of resource base integrated in research and agronomic decision-making: specifically topographic and soil information.	Improved decisions lead to greater economic, social and environmental benefits.
Output Targets 2006	Global derivates of high-resolution digital elevation models for tropical areas.	Researchers internal and external to CIAT. National agricultural and environmental NGOs and GOs.	Accurate topographic information incorporated in analyses of agrobiodiversity and in research on soil and water management.	
Output Targets 2007	Approved proposal to develop high-resolution soil information for Africa.	Researchers internal and external to CIAT.	Accurate soil information incorporated in soil fertility and water management, and in research on land degradation.	
Output Targets 2008	High-resolution soil information for Africa.	National agricultural and environmental NGOs and GOs. Researchers internal and external to CIAT.	Accurate soil information incorporated in soil fertility and water management, and in research on land degradation.	

	Outputs	Intended User	Outcome	Impact
OUTPUT 2	Insight and information of biological limitations to agricultural development from spatial analysis of agrobiodiversity.	Researchers internal and external to CIAT, agricultural decision makers in Africa, Asia and Latin America.	Incorporation of information on biological limitations in site-specific selection and targeting of genetic resources.	Increased income to producers from improved deployment of genetic resources.
Output Targets 2006	Homologue concept demonstrated, verified and published. (Shared output with IP6 Tropical Fruits Project).	Decision makers in producer associations, NGOs, and GOs.	Tools are used for identification of genetic resources that are deployed to support agricultural development.	
Output Targets 2007	Homologue adapted for 1-km spatial resolution, and concepts extended to Africa. Floramap v 1.3 updated to include higher resolution climate database.	Decision makers in producer associations, NGOs, and GOs.	Tools are used for identification of genetic resources that are deployed to support agricultural development.	
Output Targets 2008	2-4 new options (species, varieties, or genotypes) characterized and environmental target niches identified.	Individual producers and the organizations that work with and for them.	Production systems are diversified with new genetic resources.	

	Outputs	Intended User	Outcome	Impact
OUTPUT 3	Indicators of risk, resilience and vulnerability of tropical agricultural systems to stresses.	Decision makers in producer associations, NGOs, and GOs especially in Africa and Latin America.	Adoption of sustainable land management practices across spatial scales and decision-making levels reduces significantly land degradation.	Improved quality of resource base and enhanced agricultural productivity.
Output Targets 2006	Approved GEF Proposal on high resolution, national scale indicators of land degradation.	Researchers and project partners internal and external to CIAT.	Development of GEF project alliance.	
Output Targets 2007	Indicator maps of vulnerability to natural hazards produced at regional, national and sub-national scale in 6 countries as part of GEF.	Decision makers in producer associations, NGOs, and GOs.	Decision makers use information for identification and targeting of site-specific land use and management options.	
Output Targets 2008	Vulnerability framework for policy-makers developed and included in WB methodology.	Decision makers in producer associations, NGOs, and GOs.	Decision makers understand and apply principles of vulnerability analyses for disaster preventation.	

	Outputs	Intended User	Outcome	Impact
OUTPUT 4	Local information and information management systems that support specific individual and collective action by producers.	Individual producers and the organizations that work for and with them.	Land use systems and their management locally changed based on previously not available information and access to information.	Economically and ecologically sustainable cropping systems. Increased participation of rural communities in higher value agricultural product supply chains.
Output Targets 2006	Concepts and principles for site sensitive natural hazard insurance.	Organizations that work for and with producers.	NGOs familiar with natural hazard insurance.	
Output Targets 2007	Methodology, software to target higher value products to environmental niches in heterogonous hillsides. Site sensitive natural hazard insurance implemented in 2-3 cases.	Individual producers and the organizations that work for and with them. Organizations that work for and with producers.	Producer associations develop niche management for high quality products. NGOs implement natural hazard insurance.	
Output Targets 2008	Methodology facilitating dynamic adaptation of agronomic management in environmental niches to comply with changing preferences of higher value product markets.	Producer associations, organizations that work for and with them.	Producer associations adapt their organizational networks to emerging business models for higher value product supply chains.	

CIAT RESEARCH FOR DEVELOPMENT CHALLENGE III. RURAL INNOVATION: LEARNING TO INNOVATE

Project Description

Goal: Contribute to improving capacity for continuous innovation that increases the food security and income of resource-poor, rural producers and agro-enterprises.

Objective: To develop methods, approaches and technologies for improving capacity for innovation and market linkages in resource-poor rural economies

Important Assumptions: Policies and incentives do not impede the resource-poor from improving their competitiveness by building a capacity for continuous innovation. Partners are willing and able to become involved in learning and change by committing resources contributing to capacity development, and making necessary organizational innovations; Donor commitment is appropriate and constant

Beneficiaries and end Users: Beneficiaries include other CG Centers, NARS, small-scale agricultural producers and agro-enterprises together with the businesses and agencies that serve them, including private, public and not-for-profit organizations, community-based organizations, farmer associations, cooperatives and universities. Among the rural poor, women and ethnic minorities and their organizations are especially important as beneficiaries.

Collaborators: Other CG Centers (e.g. CIP, CIMMYT, ICARDA, ICRISAT, WARDA), NARIs (NARS), NGOs and Community-Based Organizations in Brazil, Peru, Colombia, Ecuador, Bolivia, Honduras, Nicaragua, El Salvador, Haiti, Kenya, Uganda, Ethiopia, Sierra Leone, Laos, Nepal, Thailand, Vietnam, Malawi, Tanzania. North-south collaboration is implemented with CIRAD, NRI, PRODAR (in Lima), IDRC, CIP, IITA, SEARCA, UPWARD, CARE, CRS, Foodnet; CIPASLA (Colombia), CLODEST (Honduras), Africare (Uganda), TIP (Tanzania), ADD-Lilongwe (Malawi), SABRN (Malawi and Tanzania), ODAR-IICA (Peru), members of PhAction (GTZ, NRI, JIRCAS, ACIAR, CIRAD, FAO, IITA, CIP, IFPRI, IRRI); ASARECA (Foodnet), the W.K. Kellogg Foundation Latin America Program; Fundación Chasquinet; the Global Knowledge Partnership (GKP), and the Global Association for Progressive Communication (APC); REDCAPA (Red de Instituciones Vinculadas a la Capacitación en Economía y Políticas Agrícolas en América Latina y el Caribe).

CIAT RESEARCH FOR DEVELOPMENT CHALLENGE III. RURAL INNOVATION: LEARNING TO INNOVATE (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1 **Information and Communications for Rural Communities**	Methodologies developed for fostering learning and knowledge-sharing (KS) in agricultural innovation systems	NARS: public and private sector R&D organizations	At least 40 organizations are involved in Learning Alliances and are regularly interacting with one another, through face-to-face meetings and virtual platforms.	More dynamic learning and KS speed the processes of social and technological innovation in rural communities, leading to the identification of new market options for farmers and more effective strategies for strengthening their links to markets through sustainable enterprises that enable them and other rural people to improve their livelihoods.
OUTPUT 2 **Rural Agroenterprises Development**	Methodologies tested and disseminated for sustainably linking poor rural economies with profitable and dynamic markets	- NARS: public and private sector R&D organizations, - Rural business service providers - Private sector agents, retailers and processors - Producer organizations	At least one regional network supporting rural business service providers and national innovation systems in at least three countries in Latin America, Eastern Africa or Asia use the territorial approach and related methodologies for agro-enterprise development	The number of farmer organizations linking poor producers to dynamic markets has increased where the territorial approach is used, leading to more diversified livelihood options for farmers including profitable, higher value and value- added products
OUTPUT 3 **Participatory Research Approaches**	Participatory co-development and commercialization of new technologies in agricultural innovation systems implemented	NARS, Other national and international R&D Providers, private sector, and farmer organizations in Latin America and Caribean, sub-saharan	PPB/PVS methodologies widely used in at least 10 countries. Farmers and R&D providers innovate in their production systems and value chains through	Poor farmers have a wider diversity of better adapted genetic materials available and more healthy agro-ecosystem management strategies.

	Outputs	Intended User	Outcome	Impact
		Africa and south east Asia directly and globally.	the use of PPB/PVS crops or forages and agro-ecosystem health management strategies in at least 3 countries in Africa, Asia and Latin America	
OUTPUT 4 **Participatory Research Approaches**	Community-led participatory research methodologies for organizational and technological innovation in agriculture tested and widely disseminated	Organizations and actors involved in rural innovation systems, e.g., IARCs, NARS, NGOs, private sector	Through the application of participatory methodologies, at least 25 examples documented of innovation in rural communities strengthened through better articulation of their demand for research and of their capacity for generation of knowledge, with R&D providers	Better integration of local communities with research and development organizations leading to improved and more sustainable rural livelihoods
OUTPUT 5 **Participatory Research and Gender Analysis**	Mainstream gender analysis and equitable participatory research to promote learning and change through partnership with CG Centers and NARS so that they can better target the demands of beneficiary groups, particularly poor rural women.	IARCs, NARS and their partners.	Capacity for mainstreaming gender sensitive participatory research approaches has increased in at least 4 NARIS and/or IARCs as a result of training	Significant improvements in the food security income generation and empowerment of rural women who are beneficiaries of CGIAR research as a result of mainstreaming use of gender sensitive participatory research approaches

CIAT PROJECT SN-1: RURAL AGRO-ENTERPRISES DEVELOPMENT

Project Description

Goal. To improve the livelihoods of rural communities in developing countries by promoting improved business support services to enhance smallholder competitiveness.

Objective. To develop strategic research products in collaboration with development agencies, private enterprise and the State to promote improved market access of rural economies with profitable and dynamic markets.

Purpose: To develop methods, tools and applications that address the entrepreneurial development needs of business development partners that support rural communities, with an emphasis on diversification and value-addition.

Assumptions:

- Secular decline in commodity prices does not fall to levels or sustained a base levels, such that incremental advances in agro-enterprise activities are not overwhelmed by macro economic losses in income from producers of major commodities.
- Political and institutional support for sustainable rural and agricultural development at the reference sites and targeted countries is maintained.
- Natural disasters or civil strife do not impede progress toward the project's goal.
- Collaborating institutions have adequate capacity, knowledge, local management support and resources to use the materials and tools developed.
- Natural disasters or civil strife do not impede progress toward the project's goal.

Clients: Technical personnel of GOs and NGOs in rural development and policy makers from public and private sector.

Business partners: Farmer groups (men and women), entrepreneurs, and local business support service who benefit from co-innovation and information based applications that enhance access to high volume and high value market opportunities.

Collaborators:
Development of methods and technology components
Public sector: NRI, PRODAR (in Lima), IDRC, CIP, IITA, SEARCA, UPWARD.

Private sector: Radioworks, Busylab, Uganda Grain Traders

Civil society: CARE, CRS, ASARECA, GTZ, Swisscontact, SNV

Execution of pilot projects: CIPASLA (Colombia), Central American Learning Alliance (Honduras, Nicaragua, El Salvador and Guatemala), Andean Region Learning Alliance (Peru, Ecuador, Bolivia and Colombia), Africare, Africa 2000 Network, (Uganda), TIP (Tanzania), ADD-Lilongwe (Malawi).

Training and networking: CATIE – diploma course, CRS global learning alliance, (Kenya, Ethiopia, Tanzania, Sudan, Uganda, Rwanda, Burundi, Eritrea, Madagascar, Burkina Faso, Mali, Niger, Gambia, Senegal, Sierra Leone, Ghana, Liberia Democratic Republic of Congo,

Honduras, Nicaragua, Guatemala, El Salvador, Haiti, Peru, Ecuador, Afghanistan, India, Pakistan, Philippines, Vietnam, Laos, Cambodia, Timore l'est, and Aceh;

ICRA – marketing and agro-enterprise support; PRODAR-IICA (Peru), members of P*h*Action (GTZ, NRI, JIRCAS, ACIAR, CIRAD, FAO, IITA, CIP, IFPRI, IRRI); ASARECA (Foodnet); Central American Learning Alliance (GTZ, CARE, Swisscontact, CATIE, SNV, UNA); Andean Regional Learning Alliance (Colombia, Ecuador, Peru, Bolivia).

Project Changes: The project has updated the logframe based on progress made in the past 5 years and with the addition of a new policy dimension to the work.

Project Funding:

Budgeting 2004-2008

Years	**2004**	**2005**	**2006**	**2007**	**2008**
US Dollars (millions)	1.243	1.485	1.473	1.481	1.446

CIAT PROJECT SN-1: RURAL AGRO-ENTERPRISES DEVELOPMENT (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1 – Rural Business Development Services	Alternative rural agro-enterprise methods, strategies, and applications that effectively link smallholder farmers and rural services with value chain opportunities widely adopted by research and development partners, State organizations and private sector. (5 years)	Development agencies and service providers including NGOs, Gov extension workers, local business support providers, private sector, farmer organizations.	More effective identification and exploitation of market opportunities by poor rural communities.	• Increased and more diversified incomes for poor rural communities.
Output Targets 2006	• Agro-enterprise methods and strategies validated and adopted on mass by partners, materials published in print and disseminated via electronic formats in English, Spanish, French and at least one other language.	• Service providers including NGOs, Gov extension workers, local business support providers, Private sector entrepreneurs engage with increasing emphasis on higher value products	• Service providers and farmer organizations focus on market led processes to drive their innovation systems.	
Output Targets 2007	• Agro-enterprise methods and strategies, market based software applications validated and contextualized with development partners, products published in print and disseminated in electronic formats available in English, Spanish, French, Vietnamese and Swahili.	• Development partners and service providers linked to selected market chains , enhance through Local ICT providers, and CBO's	• Market based software and ICT market information applications will open new opportunities for commercial investment.	

	Outputs	Intended User	Outcome	Impact
Output Targets 2008	• Training materials for agro-enterprise completed, software applications commercialized, web based marketing portals expanded through partners with emphasis on private sector business development partners, available in 10 languages.	• Marketing services in East and Western Africa linked to private sector software houses. NGO's, farmer associations, Micro-finance, NGO's, farmer associations	• Private sector invest in services and farmers link services and financial investments in higher levels of innovation and market engagement.	
OUTPUT 2 – Understanding Institutional Innovations for increased rural investment and business expansion	Understanding institutional innovations to facilitate market linkage, collective action and financial support for improved market entry and business development among segmented rural agro-enterprises evaluated and tested with partners in selected sites (10 years)	Strategic partners from NGOs, Gov extension, private enterprise, donor agencies and farmer organisations	New business approaches and financial instruments enable institutions to extend enterprise opportunities deep into rural communities targeting both high volume and high value markets, with scaling opportunities realized through ICT expansion and co-investment between public and private sector partners	Increased and more diversified incomes for poor rural communities
Output Targets 2006	• Processes of co-development in agro-enterprise topics initiated with partners in at least 15 countries in Latin America, Africa, and Asia and available in at least 3 major languages.	• Strategic partners from NGOs, Gov extension, private enterprise, donor agencies and farmer organisations	• Strategic partners invest in learning process and integrate marketing skills into project development and implementation	

	Outputs	Intended User	Outcome	Impact
Output Targets 2007	• ICT based knowledge management systems and first level enterprise "tool box" learning alliance completed in selected sites in LA, SE Asia and Africa, scaled up to 30 countries.	• Clients: Strategic partners from NGOs, Gov extension, private enterprise, donor agencies and farmer organisations	• Strategic partners invest in learning process and integrate marketing skills into project development and implementation	
Output Targets 2008	• Expansion of and ICT related knowledge management systems expanded and deepened in 30 countries, with second order "strategic" learning alliances established and University courses mainstream agro-enterprise concepts with partners in Latin America and Africa and rural finance mechanisms linked with non-financial business development services	• Strategic partners involved with co-innovation of new processes and products	• Strategic partners invest in new areas for co-innovation, such as linkage between HIV and enterprise, Gender and market chain equity, local policy reform and enterprise	
OUTPUT 3 – Pro-poor policy options for the rural communities in LDCs and DCs	Policy options to enhance access to markets for small holder farmers developed and advocated with partners at local, national and international levels. (5 years)	National and regional policy makers in Asia, Africa and Latine America; donors and private sector, NGOs, advocacy groups.	Partners using national and cross continental data to formulate better policy options for smallholder farmers in LDC countries to enhance access to selected high volume, higher value and value added markets.	Increased and more diversified incomes for poor rural communities

	Outputs	Intended User	Outcome	Impact
Output Targets 2006	• Guide on policy mechanisms to link small-scale farmers effectively to regional, national and international agri-chains, including super markets and to improve governance and equity in the production chain approach developed, based on research with development partners and state organizations.	• Policy makers in Andean region • Donor and private sector partners	• Policy makers have new options to support local enterprise development • Change in arrangements between target partners.	
Output Targets 2007	• Projects developed to link major private sector firm and smallholder farmers with criteria of equity, NRM and economic sustainability, with reference to the impact of globalization trends on selected trade opportunities for small-scale producers in selected sites.	• Advocacy groups, NGO's, Policy and economics researchers, National – regional trade policy groups, Private sector firms	• Debate for alternative trade policy options. • Workable model for linking smallholders with major private sector firms in a sustainable fashion.	
Output Targets 2008	• Guide on policy mechanisms to link small-scale farmers effectively to regional, national and	• Policy groups as above	• Broader understanding of impact of current policies on CGIAR clients and beneficiaries	

	Outputs	Intended User	Outcome	Impact
	international agri-chains, and to improve governance and equity in the production chain approach validated and adjusted.			

CIAT PROJECT SN-3: PARTICIPATORY RESEARCH APPROACHES

Project Description

Goal: To increase the relevance of R&D outputs and enhance community empowerment, with emphasis on gender equity, through developing and applying participatory research methods, tools, skills and organizational principles to improvecapacity for innovation in resource-poor rural economies.

Objective: Community-managed participatory research methodologies for organizational, institutional, and technological innovation in agriculture, co-developed, tested and widely disseminated, to benefit resource-poor farmers, with emphasis on ethnic minorities and women.

Important Assumptions: Institutional, economic, and political stability; Participatory research approaches remain a priority in the CG; Donors allocate sufficient resources to participatory research approaches.

Beneficiaries and End Users: This work will benefit small-scale resource-poor farmers, processors, traders and consumers in rural areas, especially in fragile environments. IPRA has a strong focus on supporting rural women and the poor to build their capacity to generate, access and use technological innovation, market opportunities and better manage their resources, to their own advantage. Research and development service providers will receive more accurate and timely feedback from users about acceptability of technology and market options. Research and development systems and policy-makers will benefit from methods for conducting participatory research and linking local demands with service providers.

Collaborators: ***In Latin America:*** Honduras: Escuela Agrícola Panamericana-El Zamorano (EAP), Fundación para la Investigación Participativa con Agricultores en Honduras (FIPAH), Programa de Reconstrucción Rural (PRR), Centro Universitario del Atlántico (CURLA); Nicaragua: Instituto Nacional de Investigaciones (INIA), U. Campesina (UNICAM); Ecuador: Instituto Internacional para la Reconstrucción Rural (IIRR), Instituto Nacional de Investigaciones Agropecuarias (INIAP)-Programa FAO, Fundación Antisana, Proyecto MANRECUR; Venezuela: Fondo Nacional de Investigaciones Agropecuarias (FONAIAP). Bolivia: Ministerio de Asuntos Campesinos, Indigenas y Agropecuarios (MACIA), U. Mayor de San Simón (UMSS), Fundación PROINPA, Sistema Boliviano de Tecnología Agropecuaria (SIBTA), FDTA-Valles, FDTA-Altiplano, FDTA-Chaco, FDTA-Trópico Húmedo, Proyecto, INNOVA, Agua y Tierra Campesina (ATICA), Programa Nacional de Semillas (PNS), Centro de Investigación Agrícola Tropical (CIAT), Servicio de Desarrollo Agropecuario de Tarija (SEDAJ), Coordinadora de Integración de Organizaciones Económicas Campesinas (CIOEC), Programa de Desarrollo Integral Interdiciplinario (PRODII), Centro de Apoyo al Desarrollo (CAD), Comunidad de Estudios Jaina, eight grassroots groups; Colombia: Corporación Colombiana de Investigación Agropecuaria (CORPOICA), Organizaciones Campesina, U. Nacional de Colombia.
***In Africa*:** Uganda: National Agricultural Research Organization (NARO), Africare; National Agricultural Advisory Services (NAADS); African Highlands Initiative (AHI); Africa2000 Network, Vision for Rural Development Initiative (VIRUDI); Local government;

INSPIRE Consortium; Network of Farmer Field Schools (FFS); Makerere University Malawi: Department of Agricultural Research Services (DARS); Ministry of Agriculture (Agricultural Development Divisions); Plan Malawi; Land o Lakes. Tanzania: District Agricultural and Livestock Department Office (DALDO), Traditional Irrigation and Environment Protection Programme (TIP), World Vision - Sanya Agricultural Development Programme, Usambara Lishe Trust. Kenya: Kenya Agricultural Research Institute; Community Against Desertification (CMAD); Maendeleo Agricultural Trust Fund (MATF) of Farm Africa; Kenyatta University. DR Congo: Institut National de Research et Etudes Agronomiques (INERA); Innovative Resources Management (IRM). Mozambique: Instituto de Investigacao Agricultura Mozambique (IIAM), Institut des Sciences Agronomiques du Rwanda (ISAR), Rwanda. Zimbabwe; University of Zimbabwe Austria: BOKU, University of Natural Resources and Applied Life Sciences.

***Regional Networks in Africa*:** East and Central Africa Program Agricultural Policy Analysis (ECAPAPA), Eastern and Central Africa Bean Research Network and Africa Highlands Initiative (AHI) of the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA); Southern Africa Bean Research Network, African Soil Fertility Network (AFNeT), Pan African Bean Research Network

Explanation of any Project changes (with respect to previous MTPs):

We reworked our log-frame this year to reflect the fact that the project has adopted an innovation systems' perspective and to reflect the global nature of our work. IPRA's focus in Africa is expanding rapidly, with a new emphasis on 'Enabling Rural Innovation' which is a more integrated approach than our initial focus on researching and developing community-managed participatory approaches. While we continue with this focus, we are now researching and developing participatory approaches that strengthen other parts of rural innovation systems, for example through fostering institutional learning, and change, social capital and linking farmers to markets. In addition, the change in our log-frame reflects that our earlier public goods (e.g. Local Agricultural Research Committees (CIALS) have been adopted by a large network of organizations and this presents new opportunities. We are also focusing on developing a sustained national capacity for "managing innovation" by linking with institutions of higher learning to catalyze and support local innovation processes. Our overall focus continues to be to develop approaches that strengthen the interaction between rural communities and the wider innovation systems in which they are embedded.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	1.468	1.112	1.103	1.109	1.083

CIAT PROJECT SN-3: PARTICIPATORY RESEARCH APPROACHES (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Methodologies for strengthening farmers' organizations and rural innovation systems[2], developed and disseminated	Organizations and actors involved in rural innovation processes, e.g., IARCs, NARS, NGOs, private sector companies in Latin America and Africa	Rural innovation systems strengthened through institutional learning and change so that farmers and farmer organizations have increased capacity to innovate.	Better targeted and more efficient management of rural innovation processes leading to improved sustainable livelihoods
Output Targets 2006	Three participatory methodologies researched and tested at least two national programs in Latin America and Africa		Rural innovation systems strengthened through institutional learning and change	
Output Targets 2007	By the end of 2007, a set of methodologies and tools for strengthening farmers organizations and documenting innovation histories, developed and disseminated	Ditto	Farmers and farmers organizations have increased capacity to better manage their resources and demand research and development services	
Output Targets 2008	The impact of participatory research methodology evaluated and disseminated	Policy makers in organizations and actors involved in rural innovation systems, e.g., IARCs, NARS, NGOs, private sector	Changes in decision-making and policies in partner organizations to better foster rural innovation occur in at least two innovation systems in Latin America or East Africa	

[2] By rural innovation system we mean the network of organizations that influence rural innovation. Rural innovation systems can include: farmer groups; NGOs, financial organizations; national and international research institutes; and, local and national government agencies.

	Outputs	Intended User	Outcome	Impact
OUTPUT 2	Organizational and institutional mechanisms and policies for using participatory research methodologies in the co-development of technologies, designed and tested, with rural innovation systems, in Latin America and Africa	Communities, Organizations and actors involved in rural innovation processes, e.g., IARCs, NARS, NGOs, private sector companies.	Improved decision-making and policies to better foster rural innovation occur through enhanced capacity of rural communities for co-development of technologies.	Faster development and adaptation of more appropriate technologies leading to improved sustainable livelihoods, especially for the rural poor
Output Targets 2007	Effective partnerships for supporting the rural innovation systems, developed with national and international organizations in 4 Latin American countries,	Organizations and actors involved in rural innovation processes, e.g., IARCs, NARS, NGOs, private sector companies.	Changes in decision-making and policies in partner organizations to better foster rural innovation occur through co-development of technologies in Latin America or East Africa	
Output Targets 2008	Principles, guidelines and processes for the co-development of technologies within a community-managed innovation system (CAIS), validated	Ditto	Ditto	
OUTPUT 3	A resource-to-consumption framework for enabling rural innovation and empowering rural women to increase food security,	Communities, Organizations and actors involved in rural innovation processes, e.g., IARCs, NARS, NGOs, private sector companies.	Enhanced capacity of rural communities in the pilot learning sites to plan and manage initiatives to meet their needs	Farmers have increased their income and productivity.

	Outputs	Intended User	Outcome	Impact
	access market opportunities and better management of their resources, tested and applied in Africa and Latin America			
Output Targets 2006	The resource-to-consumption framework for enabling rural innovation tested and validated with partners in 4 new countries in Africa and Latin America	Organizations and actors involved in rural innovation processes, e.g., IARCs, NARS, NGOs, private sector companies.	Rural innovation systems strengthened through strengthened farmer organizations with better links to markets and formal research and extension organizations.	
Output Targets 2007	At least 65% of NARS, NGO, and private sector partners are applying the resource-to-consumption system for Enabling Rural Innovation, in their projects and programs	Ditto	Ditto	
Output Targets 2008	Increased Knowledge and Skills of Groups and Farmers from Communities in Pilot Areas to Manage Better (Their Resource, Identify and Develop Agro-Enterprises, Better Organize Their			

	Outputs	Intended User	Outcome	Impact
	Communities and to Link-Up with Rural Service Providers)	Ditto	Ditto	
OUTPUT 4	Methodologies for strengthening community-managed and institutional participatory monitoring and evaluation systems (PM&E) validated and widely disseminated			Improved relevance and impacts of R&D projects through strengthening the capacity for learning and self-reflection; assessing impacts; and building in corrective loops into rural innovation systems
Output Targets 2006	Increased knowledge and skills of at least four R&D teams of facilitators from partner institution, to establish and support PM&E processes at farmer associations and project levels in Africa and Latin America	Communities, organizations and actors involved in rural innovation processes, e.g., IARCs, NARS, NGOs, private sector companies	Improved implementation of rural R&D projects through better expression of user-demands; community ownership of projects; project monitoring and evaluation, and better targeting of interventions to meet the needs of the poor	
Output Targets 2007	Local and scientific indicators for monitoring and evaluating livelihood, environmental, and NRM impacts of community-based projects in different contexts (across diverse R&D institutional frameworks and projects), developed	Ditto	Ditto	

	Outputs	Intended User	Outcome	Impact
Output Targets 2008	At least 50% R&D partners and communities have institutionalized PM&E systems in their projects and programs	Ditto	Ditto	

CIAT PROJECT SN-4: INFORMATION AND COMMUNICATIONS FOR RURAL COMMUNITIES

Project Description

Goal: To help the rural poor build sustainable livelihoods by improving the flow of genuinely relevant information in and among rural communities, decentralized governments, and research and development (R&D) organizations.

Objective: To strengthen local capacity for innovation by better enabling rural communities and the governments entities and R&D organizations that serve them to obtain, generate, use, and share information and knowledge, with the aid of new information and communications technologies (ICTs).

Important Assumptions: Rural communities can obtain affordable, reliable access to the Internet and other new ICTs, effectively linked with the use of more conventional or traditional communications channels. National and local organizations commit themselves to providing rural communities with relevant information services. Rural communities prove receptive to a new information culture, involving the use of modern ICTs.

Beneficiaries and End Users: InforCom's outputs are directed mainly at developing country R&D organizations (including national institutes, foundations, universities, and NGOs) and decentralized governments seeking to improve knowledge sharing and information services, with the aim of fomenting technical and social innovation, especially in supply chains for high-value crops. Another potential end user with which the project is starting to build relationships consists of international NGOs and aid agencies, interested in incorporating our outputs into their development projects. The ultimate beneficiaries of these outputs are small farmers and other supply-chain actors, who can use information and knowledge to strengthen their market links or who can play valuable roles in the provision of information services.

Collaborators: InforCom collaborates with other CGIAR centers, mainly in its work on knowledge-sharing (KS) approaches. For the purposes of that and our work on information networks in the rural sector, the project is building alliances with developed country universities and with a variety of national organizations in Colombia and other developing countries where we're establishing projects. Among these national collaborators are universities, NGOs, and government organizations that promote rural innovation. In addition, InforCom has close ties with various international entities, such as the Global Knowledge Partnership (GKP), that were created specifically to support the use of ICTs for development.

Explanation of any Project Changes: During 2005 the project combined several specific outputs into a more general one dealing with information networks in the rural sector. The aim of this change was to overcome artificial divisions between areas of our work and thus achieve a more integrated approach.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	1.118	1.143	1.134	1.140	1.113

CIAT PROJECT SN-4: INFORMATION AND COMMUNICATIONS FOR RURAL COMMUNITIES (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Methodologies and principles for building dynamic knowledge-sharing (KS) communities in and among R&D organizations.	National R&D organizations and international and national NGOs participating in collaborative alliances.	Users incorporate KS practices into a collective learning process, through which they develop and implement improved approaches for promoting rural innovation.	Poor rural communities strengthen market links, increasing or diversifying their incomes.
Output Targets 2006	By 2006, a KS strategy defined with national partners in Bolivia and Peru for joint development of an integrated approach to enhancing rural knowledge systems for participatory enterprise development.			
Output Targets 2007	By 2007, a strategy defined and implemented to enhance KS and collective learning among partners in a Central American alliance for rural enterprise.			
Output Targets 2008	By 2008, two case studies prepared and a methodology documented, based on experience in using KS			

	Outputs	Intended User	Outcome	Impact
	approaches to enhance collaborative learning among partners in the Andean Region and Central America.			
OUTPUT 2	E-learning programs and methodologies that help development professionals boost their knowledge and capacities.	Development professionals in Africa and Latin America, including some at developing country universities and others already employed by R&D organizations.	A high percentage of participants complete the courses, evaluate them favorably, and apply the principles and practices covered by the courses in their development work.	Rural incomes and agricultural productivity enhanced by more effective services.
Output Targets 2006	By 2006, the e-learning course "*Ex situ* Conservation of Plant Genetic Resources" will be updated and taught a second time to refine teaching methodologies based on the first course's feedback and evaluation results.			
Output Targets 2007	By 2007, a new e-learning course dealing with innovation management offered in English to African professionals, evaluated, and documented.			

	Outputs	Intended User	Outcome	Impact
Output Targets 2008	By 2008, African professionals participating in e-learning conducting thesis research under the joint supervision of CIAT researchers and professors at African and developed country universities.			
OUTPUT 3	Methodologies and principles for enhancing information networks in the rural sector, so that they reinforce processes such as rural planning and enterprise development.	National R&D uorganizations, international and national NGOs, ministries of agriculture, and local governments in Africa and Latin America.	Users build a capacity to analyze and strengthen information networks in relation to agroenterprise development and participatory planning, monitoring, and evaluation of rural development initiatives.	Farmers and other rural people obtain and use information that enables them to strengthen market links, build competitive agroenterprises, form cooperative alliances, and express their demands for services.
Output Targets 2006	By 2006, a case study prepared and methodology documented, based on efforts with four Bolivian partners to enhance three supply-chain information networks at the community level and beyond.			
Output Targets 2007	By 2007, a case study prepared on how information networks evolve as a result of			

	Outputs	Intended User	Outcome	Impact
	participatory planning, monitoring, and evaluation by territorial entities in Bolivia, Colombia, and Senegal.			
Output Targets 2008	By 2008, a case study and methodological tool developed, based on the implementation of an integrated approach to enhancing rural knowledge systems for participatory enterprise development at three locations in Bolivia and three in Peru.			

CIAT PROJECT SW-3: SYSTEMWIDE PROGRAM ON PARTICIPATORY RESEARCH AND GENDER ANALYSIS FOR TECHNOLOGY DEVELOPMENT AND INSTITUTIONAL INNOVATION

Project Description

Goal: Phase two (2003–2007) of the Systemwide Program on Participatory Research and Gender Analysis for Technology Development and Institutional Innovation (PRGA Program) builds on the lessons and experiences from phase one (1997–2002). These lessons can be broadly summarized as:

- An absence of a critical mass of participatory research (PR) and gender analysis (GA) practitioners in agricultural research, particularly in the CG System
- Little or no focus on gender analysis
- An unmet demand for capacity development in GA and PR methods
- While learning and change through methods development is widespread, it does not extend beyond the project life and into the organization.

Clearly, these lessons necessitate the need for renewed focus on gender analysis with its inextricable linkage to participatory research. This calls for continued focus on building capacity for the use of GA, PR and impact assessment (IA) methods, and demonstrating the impacts of using such methods. Additionally, and in order to sustain, enhance and extend learning and change to the level of the organization, it is necessary to focus on developing capacity for mainstreaming such approaches, combined with action-research to document 'best practices' for organizational learning and change.

Thus, the major goal in phase two of the PRGA Program is **to mainstream gender analysis and equitable participatory research to promote learning and change through partnerships with CG Centers, NARS and civil society groups, so that they can better target the demands of beneficiary groups, particularly poor rural women**.

Mainstreaming refers to the following activities: (a) developing capacity for GA, PR, IA and organizational development; (b) establishing a cadre of change agents versed in GA, PR, IA and organizational development skills, which is networked for support and exchange of experiences; (c) establishing internal working groups to facilitate adaptation of organizational structures and practices to initiate a demand-driven agenda within their organizations; (d) having a high-level external support group that represents the interests of clients, particularly poor rural women, and functions as a body to ensure accountability for instituting a demand-driven agenda in participating institutions.

Objective: To improve the competencies of the CG System and collaborating institutions to mainstream the use of gender-sensitive participatory approaches in plant breeding and natural-resource management research.

Important Assumptions: The success of the PRGA Program is dependent on the following.

- CGIAR Centers and partner institutions are willing to become involved in learning and change by committing staff and budget to using PR&GA methods, contributing to

capacity development of their members, and making the necessary organizational adjustments for integrating such approaches into their organizations.
- Donor commitment to the PRGA Program is constant over the period.
- IARCs and other institutions collaborating with the PRGA Program are able to include results in their institutional reports and annual reviews.
- Stakeholders are willing to contribute actively to PRGA Program planning and evaluation.

Beneficiaries and End-Users:
Beneficiaries: Poor rural women farmers, poor farmers in general.
End-users: CGIAR Centers, NARS, NGOs and rural grassroots organizations, civil society organizations.

Collaborators:
IARCs, NARS, NGOs, universities, grassroots organizations.
Collaboration of the Program with partners is through provision of small grants, workshop costs, and in-kind contribution of senior staff for joint proposal development and studies. CIP has been allocated a small grant for mainstreaming.
ICARDA: A small grant allocation for mainstreaming and contribution of senior staff time for impact-assessment studies and capacity development support for the Water Challenge Program; institutional assessment.
CIMMYT: Senior staff time and funds to co-organize a system-wide Impact Assessment workshop.
CIAT: Contribution of senior staff time for impact-assessment study of CIALs; funds to IPRA for rural innovation networks; case study of cassava-based cropping systems in Asia.
ICRAF: contribution of senior staff time for an institutional assessment to identify opportunities and challenges for institutionalizing PR&GA approaches.
ECAPAPA/ASARECA: research grants, workshop funds, and senior staff time for capacity development of 10 NARIs in the Eastern, Central and Southern Africa (ECSA) region.
Eritrea: funds and social science suppor
LiBird: small grant for PPB in maize.
CARE/Laos: small grant for assessing the lessons of gender mainstreaming.
PROINPA: on the recommendation of the Program Advisory Board, a proposal for a small research grant is being developed by PROINPA for capacity development in participatory research in general, and participatory plant breeding (PPB) in particular.
Eastern Himalayan Network: senior staff time for capacity-building for institutionalizing social and gender analysis through organizational change.
Corporación PBA: small grant for PPB manual development.
Laos University: small grant for study documenting the development and implementation of a participatory monitoring and evaluation (PM&E) process with the national agricultural extension services.
China Agricultural University: small grant for designing and implementing a study to assess the mainstreaming of participatory research approaches with its various stakeholders.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	1.197	1.460	1.167	1.048	1.037

CIAT PROJECT SW-3: SYSTEMWIDE PRGA PROGRAM (2006–2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Capacity developed for mainstreaming gender analysis and equitable participatory research—Improved competencies of the CG System and collaborating institutions to mainstream the use of gender-sensitive participatory approaches in plant breeding, and natural-resource management research	Selected CG Centers and NARS	CG System and collaborating institutions routinely use gender-sensitive participatory approaches in plant breeding, and natural-resource management research	Better-targeted R&D that benefits all end-users, especially poor women (gender groups), in target communities and regions
Output Targets 2006	• Team of 8 trainers, trained in a variety of 'best practice' approaches, established and enabled to provide training and technical support on participatory research and gender analysis (PR&GA), and impact assessment (IA) of institutional learning and change (ILAC), to scientists in their institutes; At least 10 collaborative action-research activities undertaken through strategic partnerships	NARS, NGOs, regional networks	• Collaborating institutions hold their own workshops on PR&GA, and IA of ILAC using their own trainers • An internal working group is formed to spearhead and facilitate organizational change and mainstream PR&GA in each participating institution	

	Outputs	Intended User	Outcome	Impact
Output Targets 2007	• Field training manual for PR&GA, IA of ILAC, and organizational development (OD) developed and widely disseminated, including a brief review of existing PR&GA, IA, and OD methods, drawing on best practices in developing guidelines	CGIAR, NARS, NGOs, regional networks	• Scaling up and scaling out effects of publication reaching new audiences	
Output Targets 2008	• Research results published and disseminated on the process of mainstreaming through organizational change	Other CG Centers, IARCs and NARS; other institutions interested in mainstreaming PR&GA	• Scaling up and scaling out effects of publication reaching new audiences	
OUTPUT 2	Evidence of the impact of PR&GA methods assessed, and methods developed to permit IA results to be effectively integrated into research for development decision-making	CG Centers, other IARCs, NARS, NGOs	R&D decision-making integrates IA results of PR&GA methods	Better-targeted R&D that benefits all end-users, especially poor women (gender groups), in target communities and regions

	Outputs	Intended User	Outcome	Impact
Output Targets 2006	• Results of empirical impact studies and of the impact-assessment workshop are published and disseminated; PowerPoint presentations are prepared to highlight the recent evidence on IA of PR&GA in general, and they are widely disseminated to Program collaborators and via web-site		• Researchers understand the use of PR&GA methods and have evidence available concerning their impact	
Output Targets 2007	• Collaborative action-research conducted with CG and NARS partners to develop, test, and assess methods for improving information resulting from IA (product and process impacts), and methods for assessing the contribution of IA to ILAC; Results of empirical impact studies are published as working documents and in professional journals		• The impact of participatory research, as well as how well R&D organizations have been able to learn and change as a result of their experiences in PR&GA is documented and available to researchers	

	Outputs	Intended User	Outcome	Impact
Output Targets 2008	• Discussion paper on methods of IA for ILAC is published and disseminated to Program partners and collaborators; Results of empirical studies on IA for ILAC are analyzed and published as working documents and in professional journals		• Researchers have tools and methods available to enable them to assess the impact of gender-sensitive participatory research process, and which contributes to enhanced ILAC	
OUTPUT 3	Communication strategies for learning and change with partners —PRGA Program communicates effectively with partners, donors, and other interested parties	CGIAR, IARCs, NARS, donors, anyone interested in PR&GA	Agricultural R&D practitioners utilize appropriate elements of PR&GA in their work thereby generating gender-sensitive results for equitable development	Better-targeted R&D that benefits all end-users, especially poor women (gender groups), in target communities and regions
Output Targets 2006	• Program communications strategy is up and running: Web-site regularly updated with relevant research findings and resources; International workshop held on integrating gender-sensitive participatory research through organizational change		• Partners and web-users are kept abreast of developments in all aspects of PR&GA	

	Outputs	Intended User	Outcome	Impact
Output Targets 2007	• Web-site regularly updated with relevant research findings and resources; Membership of PRGA-Info Listserv reaches 800; Mailing list built • Research results packaged into 1- to 2-page brief forms, and disseminated both as hard copy and in electronic form	IARC and NARS scientists, NGO practitioners, civil society organizations, policy-makers		
Output Targets 2008	• PRGA Program sources and redistributes 50% of relevant global agricultural PR&GA results (primarily through listservs and web-site; bibliographic database)—*if deemed feasible*	All agricultural R&D practitioners	• PRGA Program acts as a source for all relevant information on PR&GA for members, partners and other interested parties, particularly through its web-site	

CIAT PROJECT BP-1: IMPACT AND POLICY ANALYSIS FOR INSTITUTIONAL INNOVATION

Project Description

Goal: To enhance performance of decision making about resource allocation in agricultural research and development (R&D)

Objective: To generate and disseminate information and tools to improve the capacity of CIAT and its partners to make efficient and effective use of resources in agricultural research and development.

Important Assumptions: 1) Adequate funding to agricultural research and extension.

2) Decision makers willing to use economic analysis in research priority setting.

Target Ecoregión: none

Beneficiaries and End Users: Research planners in CIAT and partner organizations who make decisions on resource allocation. All stakeholders who need to evaluate the impacts of investment in agricultural and natural resource management research and development.

Collaborators:

NARS and other public sector institutions: Ministry of Agriculture, Colombia; Ministry of the Environment; Colombia; Corporación Autonoma Regional (CAR); Colombia; Ministry of Water and Irrigation, Kenya; Ministry of Agriculture, Kenya; National Environment and Management Authority, Kenya; Ministry of Planning and National Development, Kenya; EMBRAPA, Brazil; NARO, Uganda.

ARIs and universities: University of Hohenheim, Germany; Universidad de los Andes and Javeriana University, Colombia; Maseno University, Kenya; Institute for Development Studies, University of Sussex, UK; University of Maine, USA; University of Florida, USA.

CGIAR Centers, CPs and SWPs: ICRAF, ILRI, IFPRI, IITA, CIP, Harvest Plus Challenge Program, Challenge Program on Water and Food; Systemwide Program on Collective Action and Property Rights (CAPRi), Systemwide Program on Participatory Research and Gender Analysis (PRGA), Standing Panel on Impact Assessment (SPIA); Consorcio para el Desarollo Sostenible de los Andes (CONDESAN)

NGOs: World Wildlife Fund-Colombia; Semillas de Agua, Colombia, Fundacion Humedales; Sustainable Aid in Africa (SANA), Kenya

Explanation of any Project changes (with respect to previous MTPs):

The project name has been changed from "Impact Assessment" to "Impact and Policy Analysis for Institutional Innovation." The change reflects an evolution in project strategy towards combining international public goods-oriented research with methods and capacity development to contribute to processes of learning and change within institutions. In addition, the new name and slightly re-phrased outputs more clearly locate the project within the research agenda defined in the new Science Council priorities, specifically Priority #5.

Project Funding:

Budgeting 2004-2008

Year	2004	2005	2006	2007	2008
US Dollars (millions)	0.483	0.920	0.913	0.918	0.896

CIAT PROJECT BP-1: IMPACT AND POLICY ANALYSIS FOR INSTITUTIONAL INNOVATION (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Expected impacts of future research estimated, including analysis of the social, economic, policy and institutional factors that shape outcomes	Scientists and research managers; development planners and practitioners; policymakers; donors and others who make decision about how R&D resources are invested.	Changes in the way research or development funds are allocated or spent, either directly or indirectly via changes in policy	Return to R&D investments are higher, which means that more impact is achieved
Output Targets 2006	Valuation of productivity benefits and environmental services generated by land use systems in Colombia	Research managers in CIAT; Policymakers and planners in Colombia and other countries with similar ecosystems	Depending on the results, research priorities for R&D in the savannas are confirmed or revised.	
Output Targets 2007	Analysis of costs and benefits of developing and releasing transgenic crops in at least one country in LAC	Scientists and research managers in CIAT; regulatory agencies; Donors	Policy for investment in GMO research confirmed or revised	
Output Targets 2008	Potential impact of fruit research on poverty estimated	CIAT, CG and NARS researchers; policy makers; donors	Policies and programs on high value crops confirmed/revised	
OUTPUT 2	Past impacts of selected technologies, methodologies and institutional innovations developed by CIAT and partners documented	Scientists and research managers in CIAT and partner organizations; donors	Expected impact is compared with actual impact, and lessons are learned.	Return to R&D investments are higher, which means that more impact is achieved

	Outputs	Intended User	Outcome	Impact
Output Targets 2006	Assessment of early adoption and impact of improved forages in Asia	CIAT forages project and national partners; CIAT research management	Researchers, research managers and extensionists better understand what worked and what didn't, and use the knowledge to scale up results of current project and to improve design of future projects	
Output Targets 2007	The impact on poverty of strengthening collective action for watershed management assessed empirically in at least one catchment of the Andes and/or Nile basins.	CIAT and Water CP researchers and research managers; public sector environmental authorities and NGOs working on watershed management	Watershed management R&D policies and programs are reevaluated based on lessons of study	
Output Targets 2008	Analysis of impact of high-iron beans in one country in Africa	Harvest Plus researchers and partners	Researchers, research managers and extensionists better understand what worked and what didn't, and use the knowledge in design of future project activities.	

	Outputs	Intended User	Outcome	Impact
OUTPUT 3	Conceptual frameworks, empirical tools and data for understanding, monitoring and estimating the impact of research on development outcomes developed and maintained.	Researchers and analysts in CIAT and partner organizations	Researchers use their better conceptual and empirical understanding of how impact occurs and is measured to design more impact-oriented projects.	Impacts are larger
Output Targets 2006	User friendly empirical tool for quantifying and valuing environmental services developed	Researchers and planners working on economics of environmental services	Projects and policies about payment for environmental services schemes are better designed and targeted	
Output Targets 2007	Analytical framework for assessing the costs and risks of GMOs, as required in CBD, for LAC countries	CIAT and NARS researchers and managers; national policy makers and regulatory authorities; donors	Decision makers use the framework when making decisions about GMOs use.	
Output Targets 2008				
OUTPUT 4	Capacity in CIAT and its partners for generating and using impact and policy research results strengthened	Researchers and research managers in CIAT and partner organizations.	Increased capacity to generate and use economic and policy analysis results in more efficient decisions about R&D investments.	Impacts of research projects are enhanced
Output Targets 2006				
Output Targets 2007				

	Outputs	Intended User	Outcome	Impact
Output Targets 2008	Capacity built in at least 4 countries to use economic criteria and tools to assess benefits and risks of GMOs.	Planners and policy makers in countries that are signatories of Cartagena protocol.	Decision makers better able to use the economics when making decisions on use of GMOs.	

Appendix I

Financial Tables 2004-2008

Appendix II

List of Acronyms and Abbreviations
(June 2005)

LIST OF ACRONYMS AND ABBREVIATIONS

Acronyms

ACERG	Asociación de Centros Educativos del Cañón del Río Garrapatas, Colombia
ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
AfNet	African Network for Soil Biology and Fertility
AHI	African Highland Initiative
APC	Association for Progressive Communications
ARI	Agricultural Research Institute, Tanzania
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ASOBOLO	Asociación de la Cuenca del Río Bolo, Colombia
ASOCOLFLORES	Asociación Colombiana de Exportadores de Flores
AVRDC	Asian Vegetable Research and Development Center
BBA	Federal Biological Research Centre for Agriculture and Forestry, France
BCP	Biofortification Challenge Program
Bean/Cowpea CRSP	Bean/Cowpea Collaborative Research Support Program (*of the* Univ. Georgia, USA)
BOT	Board of Trustees (*of* CIAT)
CA	Département des Cultures Annuelles (*of* CIRAD)
CAAS	Chinese Academy of Agricultural Sciences
CAMBIA	Centre for the Application of Molecular Biology to International Agriculture, Australia
CAPRi	Collective Action and Property Rights
CARDER	Corporación Autónoma Regional de Risaralda, Colombia
CARE	Cooperative for American Relief Everywhere, USA
CATIE	Centro Agrónomico Tropical de Investigación y Enseñanza, Costa Rica
CBN	Cassava Biotechnology Network
CEGA	Centro de Estudios de Ganadería y Agricultura, Colombia
CENIBANANO	Centro de Investigaciones del Banano, Colombia
CENICAFE	Centro de Investigaciones del Café, Colombia
CENIPALMA	Centro de Investigación en Palma de Aceite, Colombia
CENTA	Centro Nacional de Tecnología Agropecuaria, El Salvador
CFP	Centro Fitogenético Pairumani, Bolivia
CIAT	Centro de Investigación Agrícola Tropical, Bolivia
CIDA	Canadian International Development Agency
CIFOR	Centre for International Forestry Research, Indonesia
CIMMYT	Centro Internacional para Mejoramiento de Maiz y Trigo, Mexico
CIP	Centro Internacional de la Papa, Peru
CIPASLA	Consorcio Interinstitucional para una Agricultura Sostenible en Laderas, Colombia
CIPAV	Fundación del Centro para la Investigación en Sistemas Sostenibles de Producción Agropecuaria, Colombia
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement, France
CLAYUCA	Consorcio Latinoamericano y del Caribe de Apoyo a la Investigación y Desarrollo de la Yuca, *based in* Colombia
CLODEST	Comité Local para el Desarrollo Sostenible de la Cuenca del Río Tascalapa, Honduras
CNPMF	Centro Nacional de Pesquisa de Mandioca e Fruticultura Tropical (*of* EMBRAPA)
CODESU	Corporación para el Desarrollo Sostenible de Ucayali, Peru
COLCIENCIAS	Instituto Colombiano para el Desarrollo de la Ciencia y la Tecnología "Francisco José de Caldas"
CONDESAN	Consorcio para el Desarrollo Sostenible de la Ecorregión Andina, Peru
CORPOICA	Corporación Colombiana de Investigación Agropecuaria
CRCTPP	Cooperative Research Centre for Tropical Plant Pathology, Australia
CRI	Crop Research Institute, Ghana
CRS	Catholic Relief Services, USA

CSIRO	Commonwealth Scientific and Industrial Research Organisation, Australia
CTCRI	Central Tuber Crops Research Institute, India
CURLA	Centro Universitario Regional del Litoral Atlántico, Honduras
CVC	Corporación Autónoma Regional del Valle del Cauca, Colombia
DANAC	La Fundación para la Investigación Agrícola—Danac, Venezuela
DANIDA	Danish International Development Agency, Denmark
DBT	Department for Biotechnology and Biological Control (*of the* Univ. Kiel, Germany)
DFID	Department for International Development, UK
DGIS	Directorate-General for International Co-operation, the Netherlands
DICTA	Dirección de Ciencia y Tecnología Agropecuaria, Honduras
DNP	Departamento Nacional de Planeación, Colombia
EAP-Zamorano	Escuela Agrícola Panamericana *at* Zamorano, Honduras
EARO	Ethiopian Agricultural Research Organization
EC	Economic Commission (*of the* European Union)
ECABREN	Eastern and Central Africa Bean Research Network
ECLAC	Economic Commission for Latin America and the Caribbean
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária
EPMR	External Program and Management Review (*of* CIAT)
ETH	also ETHZ; Eidgenössische Technische Hochschule—Zürich, Switzerland
E-TIP	Ecologia's Environmental Technical Information Project (online service)
FAO	Food and Agriculture Organization of the United Nations
FCRI	Field Crop Research Institute, Thailand
FEDEARROZ	Federación Nacional de Arroceros, Colombia
FIDAR	Fundación para la Investigación y el Desarrollo Agroindustrial Rural, Colombia
FLAR	Fondo Latinoamericano y del Caribe para Arroz de Riego, *based at* CIAT
FONAIAP	Fondo Nacional de Investigaciones Agropecuarias, Venezuela
FPR-IPM	Farmer Participatory Research for IPM Project (*of the* SP-IPM *and* SP-PRGA)
GEF	Global Environment Facility (*of the* UNDP, UNEP, *and* World Bank)
GRU	Genetic Resources Unit (*of* CIAT)
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Cooperation)
GWG	Gender Working Group (*of the* SP-PRGA)
HAP	Hillside Agricultural Program, Haiti
IAEA	International Atomic Energy Agency, Austria
IAR&T	Institute for Agricultural Research and Training, Nigeria
IBSRAM	International Board for Soil Research and Management, Thailand
ICA	Instituto Colombiano Agropecuario
ICARDA	International Center for Agricultural Research in the Dry Areas, Syria
ICER	Internally Commissioned External Review (*of* CIAT)
ICIPE	International Centre of Insect Physiology and Ecology, Kenya
ICRAF	International Centre for Research in Agroforestry, Kenya
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics, India
ICTA	Instituto de Ciencia y Tecnología Agrícola, Guatemala
ICWG—CC	Inter-Center Working Group on Climate Change (*of the* CGIAR)
IDEAM	Instituto de Hidrología, Meteorología y Estudios Ambientales, Colombia
IDIAP	Instituto de Investigación Agropecuaria de Panamá
IDRC	International Development Research Centre, Canada
IDS	Institute for Development Studies, UK
IER	Institut d'Economie Rurale du Mali
IFDC	International Fertilizer Development Center, USA
IFPRI	International Food Policy Research Institute, USA
IGAC	Instituto Geográfico "Agustín Codazzi", Colombia
IGDN	Inter-American Geospatial Data Network
IGER	Institute of Grasslands Environment Research, UK

IIA	Instituto de Investigaciones Avícolas, Cuba
IIA	Instituto de Investigaciones Agropecuarias, Venezuela
IIASA	International Institute for Applied Systems Analysis, Austria
IICA	Instituto Interamericano de Cooperación para la Agricultura, Costa Rica
IILA	Instituto Italo-Latino Americano, Italy
IITA	International Institute of Tropical Agriculture, Nigeria
ILAC	Institutional Learning and Change
ILRI	International Livestock Research Institute, Kenya
INBIO	Instituto Nacional de Biodiversidad, Costa Rica
INERA	Institut de l'Environnement et de Recherches Agricoles, Burkina Faso
InforCom	Information and Communications for Rural Communities
INIA	Instituto de Investigaciones Agropecuarias, Chile
INIA	Instituto Nacional de Investigación Agraria, Peru (*now* INIAA)
INIA	Instituto Nacional de Investigación Agropecuaria, Uruguay
INIA	Instituto Nacional de Investigaciones Agrícolas de Venezuela
INIAA	Instituto Nacional de Investigación Agraria y Agroindustrial, Peru (*formerly* INIA)
INIAP	Instituto Nacional Autónomo de Investigaciones Agropecuarias, Ecuador (*formerly* Instituto Nacional de Investigaciones Agropecuarias)
INIFAP	Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias, Mexico
INIVIT	Instituto de Investigaciones de Viandas Tropicales, Cuba
INPA	Instituto Nacional de Pesquisas da Amazônia, Brazil
INPE	Instituto Nacional de Pesquisas Espaciais, Brazil
INRAB	Institut National des Recherches Agricoles du Bénin
INRAN	Institut National des Recherches Agronomiques du Niger
INTA	Instituto Nacional de Tecnología Agropecuaria, Argentina
INTA	Instituto Nicaragüense de Tecnología Agropecuaria
IPCA	Proyecto de Investigación Participativa en Centroamérica, *based in* Honduras
IPGRI	International Plant Genetic Resources Institute, Italy
IPP	Institute for Plant Protection, Germany
IPRA	Investigación Participativa en Agricultura/*Participatory Research in Agriculture, based at* CIAT
IRD	Institut de Recherche pour le Développement, France (*formerly* ORSTOM)
IRRI	International Rice Research Institute, the Philippines
ISABU	Institut des Sciences Agronomiques du Burundi
ISAR	Institut des Sciences Agronomiques du Rwanda
ITRA	Institut Togolais de Recherche Agronomique
IVITA	Instituto Veterinario de Investigaciones Tropicales y de Altura, Peru
IWMI	International Water Management Institute, Sri Lanka (*formerly* International Irrigation Management Institute)
JIRCAS	Japan International Research Center for Agricultural Sciences
KARI	Kenya Agricultural Research Institute
KEMRI	Kenya Medical Research Institute
KSU	Kansas State University, USA
Lempira Sur	FAO project in Honduras to change slash-and-burn agriculture
LSU	Louisiana State University, USA
MADR	Ministerio de Agricultura y Desarrollo Rural, Colombia
MinAmbiente	Ministerio del Medio Ambiente, Colombia
MIS	*also* MIS Group; Management and Information Systems Research Group (*of the* Univ. York, UK)
MSU	Michigan State University, USA
MT	Management Team (*of* CIAT)
NARO	National Agricultural Research Organization, Uganda
NCAR	National Center for Atmospheric Research, USA
NCGR	National Center for Genome Resources, USA

NEN	North East Network
NLH	Norges Landbrukshøgskole (Agricultural University of Norway)
NRCRI	Natural Root Crops Research Institute, Nigeria
NRI	Natural Resources Institute, UK
NRMG	Natural Resource Management Group (*of the* SP-PRGA)
OFI	Oxford Forestry Institute, UK
ORE	Organization for the Rehabilitation of the Environment, Haiti
ORSTOM	L'Institut Français de Recherche Scientifique pour le Développement en Coopération (*now* IRD)
PABRA	Pan-Africa Bean Research Alliance
PASOLAC	Programa de Agricultura Sostenible de Laderas en Centro América
PBA	Corporación PBA, Colombia
PBG	Plant Breeding Group (*of the* SP-PRGA)
P*h*Action	Global Post-*h*arvest Forum
PRGA	Participatory Research and Gender Analysis
PRI	Plant Research International, Netherlands
PROCITROPICOS	Programa Cooperativo de Investigación y Transferencia de Tecnología para los Trópicos Suramericanos
PRODAR	Programa de Desarrollo de la Agroindustria Rural para América Latina y el Caribe, *based in* Costa Rica
PROFRIJOL	Programa Cooperativo Regional de Frijol para Centro América, México y el Caribe
PROFRIZA	Proyecto Regional de Frijol para la Zona Andina
PROINPA	Fundación Promoción e Investigación de Productos Andinos, Bolivia
PRONATTA	Programa Nacional de Transferencia de Tecnología Agropecuaria, Colombia
RDA	Rural Development Administration, Korea
REDCAPA	Red de Instituciones vinculadas a la Capacitación en Economía y Políticas Agrícolas en América Latina y el Caribe
RII	Rural Innovation Institute
RIVM	Rijksinstitut voor Volksgezondheid en Milienhygiene (National Institute of Public Health and Environmental Protection), the Netherlands
SABRN	South Africa Bean Research Network
SACCAR	Southern Africa Center for Cooperation in Agricultural Research and Training
SARNET	Southern Africa Root Crops Research Network
SDC	Swiss Agency for Development and Cooperation
SEA-CIAS	Secretaría de Estado de Agricultura – Centro de Investigaciones Agrícolas del Sureste, Dominican Republic
SEARCA	Southeast Asia Regional Center for Graduate Study and Research in Agriculture
SENA	Servicio Nacional de Aprendizaje, Colombia
SIBTA	Bolivian Agricultural Technology Development
SINCHI	Instituto Amazónico de Investigaciones Científicas, Colombia
SINGER	The CGIAR System-wide Information Network for Genetic Resources
SLU	Sveriges Lantbruksuniversitet (Swedish University of Agricultural Sciences)
SP-IPM	Systemwide Program on Integrated Pest Management (*of the* CGIAR)
SP-PRGA	The CGIAR Systemwide Programme on Participatory Research and Gender Analysis for Technology Development and Institutional Innovation
SRI	Soil Research Institute, Ghana
SWNM	The CGIAR Systemwide Program on Soil, Water & Nutrient Management
TAC	Technical Advisory Committee (*of the* CGIAR)
TCA	Tratado de Cooperación Amazónica
TIP	Traditional Irrigation Programme, Tanzania
TSBF	Tropical Soil Biology and Fertility Programme, Kenya (*now* TSBFI)
TSBFI	Tropical Soil Biology and Fertility Institute (*of* CIAT, *formerly* TSBF)
UBC	University of British Columbia, Canada
UCor	Universidad Católica de Córdoba, Argentina
UCR	Universidad de Costa Rica
UNA	Universidad Nacional Agraria, Nicaragua

UNAH	Universidad Nacional Autónoma de Honduras
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIVALLE	Universidad del Valle, Colombia
UPWARD	Users' Perspectives With Agricultural Research and Development, *based in* the Philippines
USDA	United States Department of Agriculture
WARDA	West Africa Rice Development Association, Cote d'Ivoire
WFCP	Water for Food Challenge Program, Sri Lanka
WRI	World Resources Institute, USA
WV	World Vision, USA
WWF	World Wildlife Federation, USA
WWW	World Wide Web

Abbreviations

Ac/Ds	The first pair of transposons discovered (biotechnology)
ACMV	African cassava mosaic virus
AES	Agroecosystem
AFS	Agroforestry systems
Al	Aluminum
ARIs	Advanced research institutes
AROs	Advanced research organizations
AYT	Advanced yield trials
BCMV	Bean Common Mosaic Virus
BGBD	Below-ground biodiversity
BMP	Best management practices
C	Carbon
CA	Central America
CBB	Cassava bacterial blight; *also* Common bacterial blight of beans
CBWM	Community-based watershed management
CC	Climate change
CD-ROM	Compact disk—read-only memory
CFSD	Cassava frogskin disease
CH_4	Methane (a pollutant)
CIALs	Comités de Investigación Agrícola Local (Colombia)
CLOs	Comités locales (local committees)
CO_2	Carbon dioxide (a pollutant)
DCs	Developed countries
DNA	Deoxyribonucleic acid
DS	Decision support
ERI	Enabling Rural Innovation
ESTs	Expressed sequence tags (biotechnology)
FM	Forest margins
FPR	Farmer participatory research
FTE	Full-time equivalent
GA	Gender analysis
GCC	Global climate change
GHG	Greenhouse gases
GIS	Geographic information systems
GKP	Global Knowledge Partnership
GM	Genetically modified
GOs	Governmental organizations
GWP	Global warming potential

HS	Hillsides
IA	Impact Assessment
IAEM	Integrated agroecosystem management and conservation
IARCs	International agricultural research centers (the CGIAR system)
ICTs	Information and communication technologies
INIAs	Instituciones Nacionales de Investigación Agropecuaria (national institutions for agricultural and livestock research)
IPDM	Integrated Pest and Disease Management
IPM	Integrated pest management
IPR	Intellectual property rights
ISFM	Integrated soil-fertility management
KS	Knowledge-Sharing
LA	Latin America; Latin American
LAC	Latin America and the Caribbean
LDCs	Lesser developed countries
LIMS	Laboratory information management systems
LoRSDIs	Local rural sustainable development initiatives
M&E	Monitoring and evaluation
MAS	Marker-assisted selection
MTA	Material transfer agreement (used in germplasm exchange)
MTP	Medium-Term Plan (CIAT)
N	Nitrogen
N_2O	Nitrous oxide (a pollutant)
NARES	National agricultural research and extension systems
NARIs	National agricultural research institutes
NARS	National agricultural research systems
NGOs	Nongovernmental organizations
NRM	Natural resource management
NZ	New Zealand
OD	Organizational Development
P	Phosphorus
PB	Plant breeding
PM&E	Participatory monitoring and evaluation
PNRM	Participatory natural resources management
PPB	Participatory plant breeding
PR	Participatory research
PRR	Phytophthora Root Rot
PYT	Preliminary yield trials
QTLs	Quantitative trait loci
R&D	Research and development
RAeD	Rural Agro-enterprise Development
RHBV	Rice “hoja blanca” virus (rice white leaf virus)
RIIs	Research intensive institutions
R-to-C	Resource-to-consumption *framework*
SLM	Sustainable Land Management
SP	Systemwide program (*of the* CGIAR)
SROs	Specialized research organizations
SRT	Single row trials
SS	Senior staff (*of* CIAT)
TLA	Tropical Latin America