Improving Rural Livelihoods:

CIAT's Medium-Term Plan 2002-2004

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CIAT's Medium-Term Plan 2002-2004

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This revised draft proposal for the CIAT Medium-Term Plan (MTP) 2002-2004 is submitted for the consideration of the CIAT Board of Trustees. It aims to provide the operational basis for implementing CIAT's new Strategic Plan 2001-2010, "Sustaining Rural Livelihoods." It thus fully replaces earlier drafts of the MTP, which were submitted to TAC in March and again in August 2001. The previous drafts did not yet reflect the implications of the new Strategic Plan and other important developments, in particular the strategic alliance with the Tropical Soil Biology Fertility Program (TSBF). Among other innovations, this draft proposes a revised research agenda for CIAT, a re-organized management structure, and the formal incorporation of the TSBF Institute into the CGIAR through CIAT.

This document will briefly review the main highlights of the Strategic Plan which shape the development of this operational MTP. It will then review some of the salient characteristics of the current environment which will influence the plan 2002-2004. Next, the revised research portfolio will be presented. Organizational changes will be discussed, and the financial underpinning of the plan will be laid out. Appendices include descriptions of CIAT research projects in the standard CGIAR format and financial tables, similarly in the standard CGIAR format.

Strategic Framework 2001-2010

Ultimate purpose: Improving rural livelihoods

CIAT's strategy focuses on the 1.2 billion people who are "absolutely poor," subsisting on less than one US dollar a day. Although economic and technological progress has reduced the proportion of the world's people who are poor, one-fifth of the world's population remains excluded from the benefits of this progress. For two-thirds of these disadvantaged people, mostly women and children, poverty means hunger, malnutrition and poor health.

Most of the tropical world's poor people live in rural areas where livelihoods currently depend on productive farming and wise stewardship of the land. Their plight is further threatened by environmental degradation, including soil degradation, global warming and loss of agro-biodiversity. Efficient, sustainable production of crops and animals in the countryside also keeps food prices low, thereby benefiting poor urban consumers, who typically spend a large part of their income on food. Overcoming poverty and environmental abuse is not only a moral imperative but also the key to a peaceful harmonious future for humanity.

Consequently, ***improving rural livelihoods*** is the central focus of the new CIAT strategic plan. In the face of persisting poverty, the opportunities and challenges of globalization, and deteriorating ecological health, CIAT aims to be ***a socially and environmentally progressive force for change.*** CIAT will conduct research relevant to the current and emerging problems of some of the world's most disadvantaged people: the poor in low-income countries. Our focus is on people, not crops or resources but people and their livelihoods.

CIAT's strategy for 2001-2010 reaffirms a basic commitment to alleviating hunger and poverty while improving natural resource management. Improving the livelihoods of the rural poor through ***high quality science*** is an effective and direct way to address their needs while ensuring a supply of cheap food for the urban poor. The sustainable livelihoods pursued by disadvantaged rural people leads to the outcomes they desire by enabling them to continuously and systematically build their physical, economic, and social assets, thereby giving them more control over their lives.

We recognize that science-driven agriculture is just one of the ingredients needed to achieve sustainable rural livelihoods just as research is but one necessary ingredient to improve agriculture. Moreover, improved agriculture, be it through higher crop yields, reduced soil erosion, or new pest control technologies, by itself does not guarantee sustainable rural livelihoods. Nor can CIAT achieve these goals alone. We must work in partnership with others with common goals and complementary strategies.

Overarching goals

As a research center specializing in people-centered solutions for tropical agriculture, CIAT uses science to help the rural poor get to three interdependent "critical conditions" along their path to sustainable rural livelihoods.

- Competitive agriculture
- Agroecosystem health
- Rural innovation

Most of the tropical world's poor live in rural areas where agriculture is the single most important source of income and employment. Without a ***competitive agriculture***, many of the rural poor will not have the employment to earn their food; farmers will not have the cash they need for essentials like medicine and education; and the urban poor risk facing hunger due to higher food prices. Intensification, diversification, and higher value added are mutually reinforcing tactics to make small farmers more competitive.

Declining ***agroecosystem health*** is the enemy of many of the rural poor. Soil erosion, nutrient decline, reduced biodiversity, depleted water resources, global warming and new pests and diseases are just some of these threats to agro-ecosystems health and the livelihoods of the poor. Fragile environments, upon which many poor farmers depend, require special attention. If properly managed, natural resources in vulnerable settings, such as hillsides, can be quite productive and may be systematically improved

Protection of soil, water, and forests, as well as pest control, often requires collectively designed solutions applied beyond the scale of the single field or farm. ***Rural innovation*** to adopt new technologies, enter new markets, better manage resources and information, can often best be done at the community rather than the individual farm level. Enhanced social capital through participatory research, information systems, and collective action are key community assets that must be fostered.

Core scientific competencies

CIAT's core assets are its scientific competencies. These are multidisciplinary teams of scientists experienced in systems approaches to issues affecting agriculture and natural resource management. Supporting them are the world's largest germplasm collections of beans, cassava and tropical forages, and an up-to-date infrastructure of laboratories and other facilities. Equally important, we have long and rich experience working collaboratively with farmers and other agricultural specialists in a variety of local, national, regional, and

international organizations. To promote sustainable rural livelihoods, CIAT will cultivate five core scientific competencies:

Agrobiodiversity and genetics. Access to high-quality germplasm—for staple crops like cassava, beans, and rice, as well as for forages and alternative high-income crops—remains a high priority for small farmers. Genetic research, applied to conserved and characterized agrobiodiversity, leads to higher crop productivity, improved plant and soil health, and better human nutrition. Advances in molecular biology and genetic transformation have markedly improved our understanding of agrobiodiversity, thereby creating new opportunities for unlocking the potential of the vast genetic diversity found in the wild ancestors and close relatives of cultivated crops.

Ecology and management of pests and diseases. Crop damage by bacteria, fungi, viruses, insects, and other pests is a perennial risk in farming and can deal a knockout blow to rural livelihoods. In response, farmers all too frequently apply pesticides excessively, both damaging the environment and the health of farm families and consumers, while often failing to effectively control pests. Safer, more effective alternatives to pest management, based on better understanding of agro-ecologies, can combine crop varieties with genetic resistance to pests and pathogens; biological control to fight pests with their natural enemies; and better farm management practices, including judicious use of agro-chemicals.

Soil ecology and improvement. Healthy, fertile soil is vital to overall agroecosystem health and agricultural competitiveness. Soil quality needs to be enhanced, especially where degradation is already a problem. The soil is also a public "ecological service": a regulator of water quality and supply, a way to break down contaminants, and even a carbon sink to slow greenhouse warming. Thus, how tropical farmers manage soil is relevant not only to *their* livelihoods but also to the survival of *all* terrestrial life. We view soil holistically, as a complex living system. Emphasis is put on managing fertility based on better understanding of factors such as nutrient flows through plants and soil organisms.

Spatial analysis. Spatial information can help produce more food with fewer environmental risks. Land use decision makers, whether local farm communities or national government agencies, need appropriate tools to analyze trade-offs. Advances in geographic information systems (GIS) and modeling, combined with participatory data collection, offer major opportunities for better land management. However, more user-friendly interfaces need to be designed. Decision-support tools can analyze farming systems and scale up farm behavior to the watershed level to better understand the effects of farmer decisions on resource degradation or improvement.

Socioeconomic analysis and participatory research. Understanding farmer and community decision making is crucial to the success of new technologies for improving rural livelihoods. Socio-economic analysis generates insights and empirically validated principles for designing people-centered solutions, relying heavily but not exclusively on participatory methods. Other important tools and outputs are models, databases, and policy recommendations. Finally, a key contribution of socioeconomic analysis will be to monitor and evaluate CIAT research outputs and assess their impact, focusing more on issues of sustainability and poverty reduction rather than just productivity.

This combination of five competencies has distinct strengths. Each area of competence brings together related disciplines that have significant scope to contribute to and benefit from scientific advancement. And each can help CIAT and its partners to achieve a direct, positive, and lasting impact on rural livelihoods in the tropics. Furthermore, these core competencies are highly complementary, allowing for integrated approaches to problem solving. Together, they will form an enduring and stable institutional framework, while at the same time giving CIAT the flexibility to respond to an evolving research agenda. As science

advances and new research problems arise, adjustments will be needed. A major preoccupation of CIAT leadership will be to ensure that the human skills, technology, and equipment pertinent to these scientific areas are up to date.

Operational Context 2002-2004

World food situation. Sub-Saharan Africa and South Asia are seen by the CGIAR as the central foci of food insecurity and malnutrition over the period of this MTP. Poverty and associated food insecurity, much of it still rural, remains a significant problem, especially in Central America and Andean countries even though some Latin American countries will have strong per capita food production. Increasing international trade, financial flows, technology diffusion, rapid urbanization and ever-easier information flows will be characteristics of the period. Violent conflicts will be a major source of food insecurity and will divert attention from agricultural development in many situations, including countries in which CIAT works. There are a number of emerging health crises including the HIV/AIDS pandemic, the re-emergence of malaria, and micronutrient deficiencies which will affect agricultural productivity as well as human health.

Environmental challenges. As the reality of climate change is ever more evident, there is a growing concern about how agriculture and food production can adapt, especially in low income tropical countries. Extreme climate events appear to be growing in frequency, and will have an effect on soil and water resources that are already subject to substantial pressures towards degradation. The rural poor are especially vulnerable to these processes, and water will be a limiting factor in many regions. Ongoing trends of loss of agrobiodiversity will not be self-correcting.

Science and technology. Rapid advances in molecular biology will continue as will advances in computer and information sciences that expand the potential for modeling complex processes, both ecological and for human decision making. Associated with progress in biotechnology are new institutional frameworks, most importantly related to intellectual property rights, ownership of germplasm, and increased environmental and health regulation of novel agricultural technologies. CIAT needs to be active in harvesting useful new techniques at the frontiers of science and to keep abreast of changes in the policy realm that affect the development and deployment of agricultural innovations.

Agricultural research systems. Resources will remain highly constrained in most public sector systems in the tropics. Except for a handful of the larger countries, national research capacity will not be sufficient to meet challenges to increase productivity while respecting the environment. Regional research networks operated by national programs will be increasingly emphasized, but are likely to remain dependent on non-sustainable external funding. The private sector will have a growing role in a few field crops in a growing range of countries, but will not provide significant technologies for a wide array of tropical crops. Substantial private investment in major crops in the temperate countries risks leading to a widening technical gap in many tropical crops. Innovative approaches to harnessing the private sector could make a major contribution in the tropics.

CGIAR. There will be continued efforts at institutional reform based on strengthening the CG Secretariat and the Executive Council. Challenge programs are expected to emerge as a major element in the CG. While these programs will provide opportunities for increased collaboration among centers and between centers and advanced research institutes and NARS, at the same time they are likely to sharpen competition for resources. It is expected that the challenge programs will attract new resources, but there is no prospect for increased unrestricted resources for CIAT and the ongoing process of decline in unrestricted resources since 1989 can be expected to continue through the MTP period.

Innovations to CIAT's Research Agenda

Revitalizing CIAT's research agenda is the centerpiece of the MTP 2002-2004. The renewal of the research agenda is guided by four principles. First, the new research agenda must embody the spirit of the Strategic Plan 2001-2010. Second, the new research agenda must respond to emerging challenges and opportunities. Third, the new research agenda should promote integration and simplify the research portfolio. Fourth, the new research agenda should be based on existing healthy partnerships and current scientific strengths.

Four new elements are recommended for inclusion in the MTP research agenda:

- Tropical Soil Biology Fertility Institute
- Tropical fruits
- Climate change
- Information for rural development

Tropical Soil Biology Fertility Institute. Understanding and managing the soil as a living biological resource is a crucial strategy for improving soils. Enhanced biological activity including nutrient cycling and biological nitrogen fixation opens the possibility for improved and more sustainable agricultural productivity, especially for resource poor farmers in Africa for whom inorganic chemical fertilizers are not a realistic option. These approaches have been a common theme both of CIAT soils research and also that of the Tropical Soil Biology Fertility Program (TSBF) based in Kenya. CIAT and TSBF have worked closely together in the past, with elements of a common research agenda through the systemwide Soil Water Nutrient Management Program of the CGIAR, SWNMP. CIAT and TSBF have conducted joint field research, shared a scientific position, and developed proposals and raised funds together. Based on common objectives and a positive experience of collaboration, CIAT and TSBF have negotiated an agreement through which TSBF would become an institute within CIAT. To this alliance TSBF brings its cutting edge research experience on tropical soils in Africa as well as a strong network of national soil science researchers in Africa, while CIAT brings a similar body of research experience, based more in Latin America, as well as strong competencies in biotechnology, soil pests and diseases, participatory research, and spatial analysis. This alliance, supported by ICRAF which will host TSBF, creates a powerful interdisciplinary team to tackle the urgent challenges of soil fertility, especially in Africa. A close relationship between TSBF and the CIAT soil project should evolve towards a fusion of their research agendas with a continuing commitment to the SWNMP.

Tropical fruits. High value crops that generate employment and can tap growing markets can significantly contribute to agricultural competitivity and sustainable livelihoods for the rural poor. Generally the poor have scarce land resources which place severe limits on the incomes that they can generate from staple field crops. While staple field crops can be an important part of a food security strategy, they alone can not generate on small landholdings the incomes needed to lift the poor out of poverty. Consumption of tropical fruits is rising not only in tropical countries themselves, but also the demand for exports to high-income countries is also strong. These trends are likely to continue to create buoyant markets with high demand elasticity, favorable for farmer income generation. Policy makers in many tropical countries are keen to exploit these opportunities, but there is little coherent research on tropical fruits. See the project description in Appendix I for more detail on CIAT's intended strategy in tropical fruits.

Climate change. Growing evidence confirms that temperatures are rising, which may lead to future reductions in crop yields in most tropical and subtropical regions. Currently climate change is expected to slow growth in world food production, thereby leading to

higher food prices which the poor will find especially difficult to afford. In particular, food security is expected to deteriorate in Africa. The ability of countries, communities and families to adapt to and cope with climate change depends on such factors as wealth, technology, education and infrastructure. Low-income countries generally have less capacity to adapt and are thus most vulnerable to climate change. The poorest of the poor may often have the most to lose from climate change.

CIAT has been working on climate change issues for some years now and proposes to integrate this work into a focussed project, described in Appendix I. This work will build on GIS modeling research that has been attempting to better understand the impact of climate change on agriculture, especially on the poor. CIAT has also been conducting research on adapting agriculture to warmer and often drier climates where insect and disease pressures may also vary. Finally, CIAT has been conducting research on how agriculture may either exacerbate or mitigate climate change, for example, through improved digestibility of forages, land use change, and carbon sequestration. This project will articulate with the anticipated CG challenge program on climate change, to which CIAT is currently contributing the lead scientist.

Information for rural development. The information revolution has reached highly capitalized farmers and fully penetrated agricultural research systems in high-income countries. Information is rapidly and electronically available and is being used in increasingly sophisticated agricultural systems, for example, in precision farming. In comparison, poor farmers in the tropics lack information on markets, resource management options, and technology. Access to such information is increasingly feasible at the community level in many poor countries. A research strategy to better understand how to harness the information revolution for poor rural communities is described in Appendix I.

Integrating CIAT's Research Agenda

Enhancing research integration while simplifying the project portfolio is another objective of the revitalization of the research agenda in the MTP 2002-2004. This has led to the pulling together of research activities that were heretofore less tightly linked. **Genetic resources** conservation will continue, with all current resources, but rather than operating as a fully independent project, it will be folded into the Biotechnology project, thus emphasizing the close links between genetic conservation and utilization.

Similarly, the separate beans and **beans in Africa** projects will be merged into a single project, thereby restoring the complete integration that prevailed 1983-1995. In addition, a significant part of the research carried on in the beans in Africa project has not really be restricted to or focussed exclusively on beans. Elements of this more general systems research will be integrated into the IPM project, the soil project in collaboration with TSBF, impact assessment and participatory research. Work with the Africa Highlands Initiative will be linked to CIAT's hillsides project.

The **hillsides** project will be recast as a global effort, integrating research in Central America and the Andes with work in the uplands of Asia and the mid-altitude zones of Eastern and Southern Africa. While recognizing the unique characteristics of each of these regions, nonetheless there are a number of commonalities which it would be advantageous to exploit. All are regions characterized by small farmers managing a similar resource base in terms of soils and topography. Likewise many of their socio-economic characteristics are similar, for example, relatively poor integration in markets and the presence of common property of forests and water. Finally, many of the crops are the same, with forages, beans, cassava and tropical fruits widely but not universally cultivated. Parts of this work will be

carried out through the Ecoregional Program for Latin America, and others linked to the African Highlands Initiative.

Rather than continuing as a separate **small farm systems** project, systems research will be integrated into other projects as an approach. Some elements of the current systems research project will be integrated into the hillside project, while others, depending on their nature, may be integrated, for example, into soils or forage research. The objective of this change is to make the farm systems approach and integral part of a wide range of research at CIAT rather than treat it as a stand-alone activity.

Land management research, based largely on the capabilities for spatial analysis discussed above, is also seen as an approach or set of methods that is most effective when working through other thrusts of CIAT's research agenda. Instead of having a separate land management agenda, the intent is to more fully integrate land management approaches into research for the hillsides, South American savannas, and the Amazon basin. Moreover, these approaches can be integrated with soil, IPM, impact, and genetic improvement research. Because of the complexity of the current research activities of the existing land management project, it is best to use the first year of the MTP to promote an evolution of an integration of land management research as an approach to other objectives in the CIAT research agenda, rather than as an objective on its own.

CIAT's Continuing Research Agenda

Many of the current research areas of CIAT are expected to continue to contribute directly and substantially to the ultimate goal of sustainable rural livelihoods. These include some globally important public goods. Descriptions of all the projects noted in this section can be found in Appendix I. These project descriptions do not yet reflect the merging of activities from other projects as discussed in the preceding section. Planning to integrate these activities will initiate at the annual staff meeting in November, and will be complete before the meeting of the BOT Executive and Finance Committee in early 2002.

Cassava research will focus on making it a competitive alternative for resource poor farmers. Priority will be placed on reducing production costs and increasing product quality, for example, through improving starch quality or vitamin A content. Major partners will include IITA in Africa, EMBRAPA in Brazil, the CLAYUCA consortium with the private sector in Latin America, and the Cassava Biotechnology Network.

Tropical forages will be deployed more globally to take advantage of their multi-purpose uses as animal feed, for recuperation of degraded lands, and as a soil cover crop or erosion barrier. This global approach will be closely integrated with ILRI and the CGIAR Systemwide Livestock Program. Greater attention is being given to Southeast Asia and sub-Saharan Africa while the savannas and hillsides of the Americas also remain major targets.

Bean research will be closely linked to research networks in Africa and Latin America, if the latter are sustainable. Expected results include climbing beans better adapted to warm environments for small farmers, improved germplasm adapted to water deficits, and higher iron content for improved nutrition. Mexico and Brazil will be strong partners.

Rice research will be a very high priority for the Latin American and Caribbean region. Priority is given to strategic research to enhance the competitiveness of rice. Linked to IRRI's global rice research, CIAT will emphasize its partnerships with growers and the private sector through FLAR (the Latin America Fund for Irrigated Rice) and CIRAD of France.

Biotechnology is a key tool underpinning the genetic improvement work of all CIAT crops. The research of biotechnology is fully integrated with the objectives of the genetic improvement projects and does not pursue a separate set of objectives. The biotech lab emphasizes studies of genetic diversity and the development of markers to assist conventional breeding and some work on genetic transformation is also done.

Research on **participatory methods** develops techniques that empower local communities with the capacity to make better use of the formal agricultural research system. Flexible methods will be developed to allow for adaptation to local conditions. Strategic research on methods and their impact will be conducted with the Systemwide Farmer Participatory and Gender Research Program, and the methods will be disseminated globally through the Future Harvest Centers and other partners.

Research on methods to establish small **rural agroenterprises** to link market opportunities, processing technologies and environmentally sound production will yield principles that can be applied globally. Primary users will be technical personnel in rural development. Priority will be placed on testing principles in Africa and Southeast Asia, as well as to linking with tropical fruit research in Latin America.

Integrated pest management research will feature the global effort to overcome whiteflies, part of the Systemwide IPM program. Greater attention to soil borne pests and pathogens is expected, and this work will be closely linked with that of TSBF.

Impact assessment will continue to examine key issues related to the expected potential impact of CIAT research as well as to appraising the impact of past research outputs. Increased effort will be placed on looking at the impact of non-traditional research outputs and on the policy environment as it effects the impact of biotechnology.

Explorations for CIAT's Future Research Agenda

The research areas discussed above represent the major elements of the MTP research agenda that are organized as research projects presented in Appendix I. However, research challenges and opportunities are ever changing, and CIAT is alert to the potential to include additional areas into its research program in the future.

Savanna research has long been a priority at CIAT; was for some time a separate project; and currently is the core of an important partnership with the Ministry of Agriculture of Colombia. Savannas research draws heavily on inputs from biotechnology, rice, forages, cassava, soils, land management and impact assessment.

Likewise, research on the **Amazon** basin has long been a concern of CIAT and at one time a forest margins project was explicitly oriented to deal with Amazon issues. Recently, CIAT has been in close consultation with EMBRAPA of Brazil and other centers (CIFOR, ICRAF, IPGRI) to pull together common objectives with a view to working together for the Amazon in a new multi-institutional initiative.

Water is widely being seen as an ever more critical resource both for agriculture and other uses. An important initiative is being led by IWMI with a view to forming an inter-institutional effort on water resources. CIAT would participate with its expertise in the management of hillside watersheds.

The importance of the linkages between **agriculture and health** are becoming a higher priority. CIAT has taken the lead in moving forward a consortium of institutions working on increasing the micronutrient content of important foods. This is an especially effective way of

improving the nutritional status of the poor. Other work related to human health includes IPM research to reduce pesticide use. It has not yet been decided to pull together these different activities in a unified agriculture and health research agenda, but the work on micronutrients is expected to go forward strongly.

There is an emerging set of **biopolicy** issues centered on the use of genetic resources and transformation technology. To be effective in its own research, CIAT must be alert to these issues and there is a need for a more proactive effort along these lines in the CGIAR. The issues include ownership of genetic resources, intellectual property rights, environmental and health regulation of genetically modified crops, and the impacts of biotechnology research. Some research along these lines is conducted in genetic resources, biotechnology and impact assessment.

Organizing for the MTP

Multi-disciplinary teams will be mobilized to plan and implement research **projects**, and are thus the key operational unit at CIAT. Project teams will foster a culture of cross-boundary teamwork and a results oriented approach. Projects need to integrate research, relationships with partners, and resource mobilization. The set of projects will evolve over time, and will be reviewed regularly through the annual preparation of Medium term Plans as required by the CGIAR.

Regional coordinators will harmonize research agendas, promote strategic alliances, and mobilize resources with partners in the regions. Research in the regions will be implemented through the CIAT projects but coordinated in the region by the regional coordinators.

Scientific competencies will play a major role in knowledge management to help ensure scientific quality and that CIAT uses the most effective and up to date methods to reach its research objectives. They will advise in the recruitment of scientists and will manage key capital resources.

Working groups will be constituted as needed to pool together expertise across project boundaries to respond to emerging challenges or opportunities.

The **Director General**, supported by the **Management Team**, will provide overall leadership and direction. Resource mobilization is an important function. The size and structure of the Management Team will evolve overtime, with a move towards a smaller team.

For CIAT, science is a means to promote development through sustainable rural livelihoods. Thus, **linking research with development** is an important concern. The transformation of scientific findings into outcomes for development needs to be actively pursued through a better understanding of the research process and the dissemination of research outputs.

Public-private partnerships will be of growing importance as new opportunities arise to engage the private sector in activities consistent with CIAT's objective of sustainable rural livelihoods. They can also provide mechanisms whereby the commercial sector shares the benefits it obtains from public sector research. CIAT's facilities will continue to be managed as a science park, encouraging like-minded institutions to share facilities and costs.

The **Board of Trustees** ensures that policies appropriately align objectives, programs and resources with CIAT's mission and charter. It monitors and approves the implementation of plans, budgets and policies.

Financing the MTP

The financial plan for the MTP 2002-2004 is based on a stable funding base of $31.2 million over the period of the plan. This is quite similar to the actual funding and expenditure levels in the recent past. Obtaining the resources to convert this plan into a reality can not occur without effort.

CIAT has had a series **of successes in recent years in obtaining a variety of new research grants**. Recently CIAT has obtained an important grant from USAID for the micronutrient initiative. Important new contracts have been signed with the Ministry of Agriculture and Development of Colombia. CIAT has entered a partnership to implement research related aspects of a USAID project in Haiti. The Kellogg Foundation has confirmed new support for farmer participatory research. Additional grants have been obtained for 2002 from Belgium, Canada, Germany and France, among others. Moreover, CIAT has significant new projects with good prospects in the pipeline.

CIAT has, therefore, reason to be confident about its funding prospects. Nevertheless, there are some significant risks that must be noted. Unrestricted resources have declined without exception every year since 1989, and 2002 is to be no exception with announced cuts from such key and important donors as Japan, Switzerland, and the World Bank. Moreover, the CG appears to have signaled its intention to reassign from some of the resources currently going to unrestricted support of centers to the new challenge programs. CIAT is, of course, actively seeking to participate in the new challenge programs in order to replace some of the at risk core resources. Overall, though, investment in overseas development assistance, the mainstay of CIAT financing, has been decreasing.

Consequently, it is realistic to assume that **unrestricted resources will continue to decline** over the period of the MTP. Financial stability can only be achieved by increasing income from other sources. Investment in science and technology has not suffered like overseas development assistance, so science and technology programs could be a source of some additional income. ACIAT has made a special effort to tap resources from philanthropic sources, and there is some scope for optimism.

With the decline of unrestricted funds and the growth in importance of research contracts, **internal adjustments are required**. For many years, unrestricted resources have funded the core research program while "special projects" were used to fund additional activities. Henceforth targeted funds can not be used to simply undertake additional new activities; they will have to become part of the core research program that can not otherwise be financed. Management believes that vigorous implementation of this policy can enable CIAT to escape the very significant downsizing that several centers are undergoing in 2002 due to the above mentioned donor cuts. Additionally cost saving measures are being sought in areas such as travel and purchasing.

In the last couple of years CIAT **has benefited from a decreasing cost of operations in Colombia** because the devaluation of the peso to the dollar was significantly higher than the rate of inflation. This is unlikely to go on indefinitely and it appears that the reverse may occur in 2001. If the cost of operations in Colombia increases, as it did during the early and mid-1990s, this could have a disrupting impact on CIAT's finances.

Implementing the MTP

This MTP lays out the planned research program, organization, and budget for 2002-2004. Nevertheless, much work is required to actually implement the plan. The specific operational mechanisms of the alliance with TSBF have to be worked out in practice. Similarly, with the

revitalization of the research portfolio, there will be changes in project structure. New projects will be initiated, some projects will be merged, and some activities and responsibilities will be shifted from one project to another. Developing the **new project workplans** will be an important task for scientists and managers over the next few months. This will begin in earnest with the planning week in November, and will culminate in detailed plans that will **be ready for the review of the Executive and Finance Committee meeting in early 2002**.

Likewise, considerable further detailed work will need to be done to relate the budgets of individual cost centers to the new project portfolio. While this is not expected to significantly alter the general resource assignments as reported in this document, nonetheless **updated budgets will be presented to the Executive and Finance Committee**. The overall resource distribution of the new project portfolio is contrasted in Table 1 with the previously planned levels in earlier drafts of the MTP.

In the CGIAR three-year medium term plans are prepared annually on a rolling basis. Many elements underpinning this MTP document are expected to be enduring through the plan period and beyond. Nevertheless, it is to be anticipated that there will be ongoing adjustments in the research agenda and resource assignments. These will be incorporated, as they occur, in the framework of annual three-year plans.

A major challenge will be to re-enforce strengths of CIAT's work culture, in particular integration. Internal integration promotes flexible cross boundary and inter-disciplinary research. External integration promotes good partnerships. CIAT's future success will be largely dependent on its ability to do research together, internally in teams, and externally with partners.

Table 1. MTP draft indicative budget: Comparison of current and previous versions ($US million).

	Current proposal	**Submitted to TAC April 2001**	
TSBF (pending)	0.0	n.a.	0.0
Tropical Fruit	0.5	n.a.	0.0
Climate Change	1.0	n.a.	0.0
Information for Rural Development	1.6	n.a.	0.0
n.a.	0.0	Genetic Resources	1.0
Agrobiodiversity	3.2	Agrobiodiversity	3.4
Beans	3.9	Beans	1.9
n.a.	0.0	Beans in Africa	3.1
Cassava	2.3	Cassava	1.8
Rice	2.3	Rice	2.5
Forages	3.1	Forages	2.3
IPM	1.5	IPM	1.0
Soils	2.6	Soils	1.6
Hillsides	2.6	Hillsides	1.4
Land Management	1.4	Land Use	1.9
n.a.	0.0	Systems	2.7
Agroenterprises	0.9	Agroenterprises	1.1
n.a.	0.0	NARS Linkages	1.4
Participatory Research	1.1	Participatory Research	0.9
Impact Assessment	0.8	Impact Assessment	0.6
Ecoregional	0.2	Ecoregional	0.2
Systemwide Soils	0.6	Systemwide Soils	0.8
Systemwide Participatory	1.6	Systemwide Participatory	1.7
Total	**31.2**	**Total**	**31.2**

Appendix I

Project Descriptions
2002-2004

Project SB-2: Biotechnology

Project Description

Objective: To employ modern biotechnology to identify and use genetic diversity for broadening the genetic base and increasing the productivity of mandated and selected nonmandated crops.

Outputs:
1. Improved characterization of the genetic diversity of wild and cultivated species and associated organisms.
2. Genes and gene combinations used to broaden the genetic base.
3. Collaboration with public-and private-sector partners enhanced.

Milestones:
2002 Cassava cryopreservation implemented. Screening with microarray technology initiated. Gene transfer used to broaden the genetic base and enhance germplasm of rice, cassava, and the forage grass *Brachiaria*. Marker-assisted selection implemented with cassava and beans.
2003 Marker-assisted selection implemented for rice, beans, cassava, and *Brachiaria*. ESTs generated for cassava starch and CBB. Efficient transformation system devolved for beans. Transgenic cassava tested for resistance to stemborer. Bioreactor technology implemented for cassava. Collaboration with public and private partners strengthened.
2004 Integration of genotype × environment GIS system with molecular characterization. High throughput screening of germplasm bank and breeding materials implemented, using microarray technology. Marker-assisted selection for ACMV and whitefly resistance initiated. Transgenic rice resistant to a spectrum of fungal diseases.

Users: CIAT and NARS partners (public and private) involved in crop genetic improvement and agrobiodiversity conservation; AROs from DCs and LDCs, using CIAT technologies.

Collaborators: IARCs (IPGRI through the Systemwide Genetic Resources Program, CIP, and IITA through root and tuber crop research); NARS (CORPOICA, ICA, EMBRAPA, INIAs); AROs of DCs and LDCs; biodiversity institutions (A. von Humboldt, INBIO, SINCHI, Smithsonian); and corporations and private organizations.

CGIAR system linkages: Saving Biodiversity (30%); Enhancement & Breeding (60%); Training (10%).

CIAT project linkages: *Inputs to SB-2:* Germplasm accessions from the gene bank project. Segregating populations from crop productivity projects. Characterized insect and pathogen strains and populations from crop protection projects. GIS services from the Land Use project. *Outputs from SB-2:* Genetic and molecular techniques for the gene bank, crop productivity, and Soils (microbial) projects. Identified genes and gene combinations for crop productivity and protection projects. Methods and techniques for propagation and conservation for gene bank and productivity projects. Interspecific hybrids and transgenic stocks for crop productivity and IPM projects.

Project IP-1: Bean Improvement

Project Description

Objective: To contribute to poverty alleviation through increased bean productivity with improved cultivars and natural resource management practices in partnership with NARS and other partners.

Outputs: High-yielding beans with less dependency on pesticides, fertilizers, and water. Beans with stable yield and high nutritional value that combine abiotic and biotic constraints' resistance.

Gains: Improved varieties grown on 40% of the area in Latin America by year 2004. Productivity stabilized and bean availability secured for poor rural and urban consumers in targeted areas. Pesticide use cut by 40% in targeted areas, thus reducing hazards to environment and health. Public and private researchers have access to beans with multiple resistance. Research capacity strengthened through regional networks.

Milestones:

2001 Lines combining resistance to BGMV, common bacterial blight, and BCMV are distributed in Central America, the Caribbean, and the Andean zone. Parental materials with improved drought tolerance distributed.

2002 Strategy developed for stable angular leaf spot resistance. IPM components and systems for whiteflies, pod borers, and leafminers developed and tested.

2003 Molecular markers developed for P efficiency. Commercial-seeded lines combining resistance to BCMV, BCMNV, BSMV, and bean sterility virus will be available. Information on current bean production systems updated. Marker-assisted selection developed for various biotic constraints. Lines with resistance to drought, and BGMV developed. Specialty types developed in Andean beans.

2004 Lines with resistance to ALS developed. Impact assessment studies conducted. Phosphorus-efficient and aluminum-tolerant traits combined with disease resistance in lines with commercial grain. Nutritional quality traits incorporated into cultivars.

Users: Small-scale farmers in tropical America and Africa 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 and institutions*: PROFRIJOL and PROFRIZA (Central and Andean America); PABRA (Africa). *International institutions* such as CATIE and EAP-Zamorano (Central America). Universities and other institutions in Australia, Belgium, Canada, France, Spain, Switzerland, and USA. *Resistance breeding and gene tagging*: Bean/Cowpea CRSP.

CGIAR system linkages: Breeding (70%); Crop Production Systems (10%); Protecting the Environment (10%); Networks (5%); Training (5%).

CIAT project linkages: Germplasm conservation (SB-1), germplasm characterization (SB-2). IP-1 contributes to: improved beans for Africa (IP-2), IPM (PE-1), fertilizer efficiency (PE-2), sustainable hillside systems (PE-5), and participatory research (SN-3). Its impact is assessed in BP-1.

Project IP-3: Cassava Improvement

Project Description

Objective: To generate basic understanding, tools, and improved cassava germplasm for the genetic improvement of crop, its sustainable production, and diversification of its end uses.

Outputs:

1. Genetic base of cassava and other *Manihot* species evaluated and made available for genetic improvement.
2. Genetic stocks and improved gene pools developed and transferred to national programs.
3. National programs in tropical and subtropical Latin America and Asia supported in adaptive selection and deployment of improved cassava varieties.

Gains: Cassava genotypes with resistance to major constraints, improved productivity, and an average superiority of 20% in root yield and 5% in higher starch contents. These genotypes, selected from CIAT parental populations, would represent more than US$100 million in additional income for small farmers in the tropics.

Milestones:

2002 Markers for ACMV used to combine resistance with key agronomic traits from LA sources; testing in Africa. Evaluation of new genetic variants for value-added starch traits. Advanced testing of mechanizable cultivars for industry. Biochemical bases of resistance to whitefly understood and selection criteria incorporated in breeding.

2003 Resistant cultivars released. Identification of stemborer-resistant cultivars. Elucidation of the genetic basis of inheritance of the most important agronomic traits. Preliminary testing of plants transformed for herbicide and insect resistance.

2004 Molecular markers identified for resistance to *Phytophthora* root rot, and heterologous gene probes applied to selection. Evaluation of new cultivars transformed for novel starch forms (e.g., "waxy" starch). Field evaluation of industrial clones with high carotene content for human and animal consumption. Validation of whitefly and ACMV materials.

Users: Cassava breeders will be able to meet the requirements of crop improvement more efficiently. This work will benefit cassava farmers, processors, and consumers through the development of improved cassava gene pools with higher frequency of desirable genes.

Collaborators: IITA, ORSTOM, CIRAD, DANIDA, CORPOICA, EMBRAPA, FCRI (Thailand), other NARS in Latin America and Asia, and SROs through the Cassava Biotechnology Network (CBN).

CGIAR system linkages: Saving Biodiversity (25%); Enhancement & Breeding (50%); Crop Production Systems (10%); Protecting the Environment (5%); Strengthening NARS (10%).

CIAT project linkages: Collaborates in methods and germplasm conservation with SB-1 and SB-2. Works with postharvest processing (SN-1), participatory research (SN-3), and IPM (PE-1).

Project IP-4: Rice Improvement

Project Description

Objectives: To increase rice genetic diversity and enchance gene pools for higher, more stable yields with lower unit production coats and which proportion lower prices to consumers and reduce environmental hazards.

Outputs:
1. Enhancing gene pools
2. Integrated Pest And Disease Management
3. Rice as a Vehicle to Alleviate Poverty

Gains: Broader genetic base available and germplasm better characterized. New sources of resistance to diseases, viruses, and insects incorporated and made available. Higher yielding, advanced, rice lines. Variability and stability of progenitors and of advanced materials made available to increase breeding efforts. Rational pesticide use with fewer environmental hazards. Lower unit costs conductive to higher profits and lower rice prices to consumers.

Milestones:

2002 Near-isogenic lines with QTLs associated with yield developed for use in LAC breeding programs. Molecular markers associated with blast resistance genes identified and used in marker assisted selection. Sources of blast resistance distributed to national breeding programs. Improved rice populations with broader genetic base developed by recurrent selection and distributed to national programs in LAC. Upland rice cultivars released for highlands and other ecosystems. Epidemiological studies for the control of RHBV and its vector, *T. orizicolus* completed. Potential use of transgenic plants with resistance to RHBV evaluated in the field. Rice germplasm with improved grain quality and milling developed together with FLAR. National scientists from LAC trained in new technologies used at CIAT.

2003 Improved rice cultivars using wild rice genes and recurrent selection populations. Introgression of new plan type (IRRI) into LAC's gene pools. Evaluation and selection of improved rice populations with broader genetic base by national programs in LAC. Characterization of rice blast pathogen populations in LAC. Identification of relevant blast resistance genes for LAC blast populations. Promotion of IPM strategies for controlling RHBV and *T. orizicolus*. RHBV-viral genes from transgenic plant introgressed into commercial rice cultivars. Rice germplasm with improved grain quality and milling developed together with FLAR. Selection of rice lines with tolerance to submergence for an improved weed control strategy.

2004 Genetic progress and gains in recurrent selection for different traits will be assessed in several LAC countries. Genetic gains for yield derived from interspecific crosses will be evaluated after introgression of wild genes into cultivated LAC rice varieties. Implementation of breeding methods for durable blast resistance in LAC based on population dynamics of pathogen populations and partial resistance. Molecular and virulence characterization of other rice pathogens. Management of RHBV and its vector based on epidemiological studies. Commercial rice cultivars with transgenes for RHBV tested in LAC. Participartory rice selection and breeding will be producing new rice varieties for resource poor farmers.

Users: Breeders throughout Latin America and available elsewhere. Ultimate beneficiaries are poor urban consumers and rice farmers.

Collaborators: CIRAD, IRD, FLAR (Fund for Latin American and Caribbean Irrigated Rice), IRRI, WARDA. NARS (e.g., EMBRAPA, CORPOICA, FONAIAP, IDIAP, INIAP, INIA, IIA), U.S. Universities (Cornell, Purdue, LSU, Arkansas, Texas A&M, California, Florida State), CIRAD-CA, JIRCAS.

CGIAR system linkages: Enhancement and Breeding (50%); Crop Systems (5%); Protecting the Environment (15%); Saving Biodiversity (20%); Strengthening NARS (10%). Linked to IRRI global rice research and WARDA interspecific crosses.

CIAT project linkages: Germplasm conservation SB-1, genomics SB-2, participatory research SW-3 for upland in hillsides PE-3 and cropping systems SW-2 for the savannas. Provide improved germplasm to PE-1 and PE-2.

Project IP-5: Tropical Forages

Project Description

Objective: To identify superior gene pools of grasses and legumes for sustainable agricultural systems in subhumid and humid tropics.

Outputs:

1. Genetic diversity for quality attributes, for host-parasite-symbiont interactions, and for adaptation to edaphic and climatic constraints, not only for legumes but also for selected grasses.
2. Selected grasses and a range of herbaceous and shrubby legumes evaluated with partners, available to farmers for ruminant production and for soil conservation and improvement.

Gains: Defined genetic diversity in selected grass and legume species for key quality attributes, disease and pest resistance, and environmental adaptation. Known utility in production systems of elite grass and legume germplasm. New grasses and legumes will contribute to increased milk supplies to children and cash flow for small dairy farmers, while conserving and enhancing the natural resource base.

Milestones:

2002 Defined potential of IPM components for managing spittlebug in lowland pastures. Known animal production potential of *Brachiaria* hybrids with resistance to spittlebug.

2003 Methods and tools available to enhance targeting and adoption of multipurpose forage germplasm in smallholder production systems in the hillsides of Central America. *Brachiaria* hybrids with resistance to spittlebug are released to farmers.

2004 Multipurpose legumes validated for use in priority crop/livestock systems. Prototype field management systems designed for enhancing endophytes' role in drought tolerance of *Brachiaria* species.

Users: Governmental, nongovernmental, and farmer organizations throughout the subhumid and humid tropics who need additional grass and legume genetic resources with enhanced potential to intensify and sustain productivity of agricultural and livestock systems.

Collaborators: National, governmental, and nongovernmental agricultural research and/or development organizations; SROs (Univ. of Hohenheim, Cornell Univ., IGER, OFI, CSIRO).

CGIAR system linkages: Enhancement & Breeding (20%); Livestock Production Systems (15%); Protecting the Environment (15%); Saving Biodiversity (40%); Strengthening NARS (10%). Participates in the Systemwide Livestock Program (ILRI).

CIAT project linkages: Genetic resources conserved by SB-1 will be used to develop superior gene pools, using where necessary molecular techniques (SB-2). Selected grasses and legumes evaluated in production systems (PE-5) in collaboration with national partners (SN-2).

Project PE-1: Integrated Pest and Disease Management

Project Description

Objective: To develop and transfer knowledge systems and pest and disease management components for sustainable productivity and healthier environments.

Outputs:
1. Pest and disease complexes described and analyzed.
2. Pest and disease management components and IPM strategies and tactics developed.
3. NARS' capacity to design and execute IPM research and implementation strengthened.
4. Global IPM networks and knowledge systems developed.

Gains: Increased crop yields and reduced environmental damage. Natural enemies of major pests and diseases evaluated. IPM developed, and tested and verified on farms. Increased knowledge of the biology and ecology of pests and diseases and of the damage they cause. Molecular characterization of major pathogens and diagnostic kits made available. Whitefly biodiversity characterized. FPR methods for IPM developed and implemented. Biological control agents established in new regions.

Milestones:

2002 A global network and website for information on tropical AES developed. Evaluation and dissemination of biological control agents of major pests of restricted crops. IPM projects developed for AES. Components of the IPM package for global whitefly project ready for diffusion. First crop viruses identified and diagnostic tools developed. Whitefly resistance mechanisms in cassava identified.

2003 IPM for cassava viruses and root-rot diseases implemented. Cassava germplasm with resistance to CBB identified by use of molecular markers. Research on soil-borne arthropods and pathogens advanced and coordinated with systemwide programs. Research on invasive pests defined and under way. Use of cassava varieties tolerant of frogskin disease in breeding and IPM programs.

2004 Biological control through entomopathogens developed for soil-borne pests. Natural enemies of whitefly available for IPM programs. Leader in information and technologies for implementing phytosanitary certification programs for cassava and other crops. Molecular markers tagging resistance to CBB available. Germplasm screened for resistance to *Phytophthora* root rot, using marker-assisted selection. Epidemiological validation of specified whitefly-transmitted geminiviruses.

Users: Biodiversity of AES determined and made available to researchers. NARS scientists, extension workers, and farmers trained in IPM methodologies. Crop yields for small farmers increased and stable production systems identified.

Collaborators: IARCs (IITA, ICIPE, CIP); AROs (e.g., CATIE, NRI, universities of Florida, Wisconsin, Cornell, and São Paulo, John Innes Center, ETH, ORSTOM, CIRAD, Boyce Thompson Institute); NARS (e.g., EMBRAPA, CORPOICA, ICA, INIAP, INIVIT, NARO); NGOs; and private industries (CENIPALMA, Compañia Agrícola de Espárragos).

CGIAR system linkages: Increasing Productivity (30%); Saving Biodiversity (20%); Protecting the Environment (40%); Strengthening NARS (10%). Whitefly and Participatory Methods Projects in the Systemwide Program on IPM.

CIAT project linkages: Collaborates with breeding projects (IP-1, IP-2, IP-3, IP-4, and IP-5) on host-plant resistance. Provides biocontrol agents to project PE-5. Uses inputs from PE-4, SB-2, and SN-3.

Project PE-2: Soils

Project Description

Objective: To develop and disseminate to clients strategic principles for protecting and improving soil quality through the efficient and sustainable use of soil, water, and nutrient resources in crop and livestock systems.

Outputs:

1. Soil, water, and nutrient management constraints assessed and plant components characterized for improved production and resource conservation.
2. Strategies to protect and improve soil quality.
3. Improved decision making for combating soil degradation and increasing agricultural production.
4. Institutional capacity enhanced for strategic research on soil, water, and nutrient management through the dissemination of concepts, methods, tools, and training.

Gains: Guidelines for selecting productive and resource-use-efficient crop and forage components. Guidelines for managing nutrients, crop residues, and green manure, and for controlling erosion and improving soil structure. Soil-quality indicators to assist farmers and extension workers in assessing soil health. A decision-support system for resource conservation and productivity enhancement. Strengthened capacity of NARS for strategic research on soil, water, and nutrient management.

Milestones:

2002 List of soil quality indicators available to NARS to monitor land degradation. Decision-making tools available for managing soil erosion, nutrient degradation, and maintenance of an arable layer. Erosion and nutrient degradation risk assessment maps available. Correlations established between local soil quality indicators and scientific measurements.

2003 A soil quality monitoring system developed and tested by partners. Farmers adopting improved system components, including crops and soil management technologies.

2004 Indicators of soil fertility, biological health, and physical quality used for decision making in hillsides and savanna ecosystems. Innovations for establishing arable layer available. Soil structure maintenance practices available for hillsides.

Users: Principally crop and livestock producers and extension workers (advisors) in acid-soil AES of LAC. Relevant also to farmers on similar soils in tropical Africa and Asia.

Collaborators: NARS: CORPOICA and CIPASLA (Colombia), EMBRAPA (Brazil); AROs: IFDC, ICRAF, ORSTOM, CIRAD, ETH (Switzerland); universities: Uberlândia (Brazil), Nacional (Colombia), Paris (France), Bayreuth (Germany), Complutense de Madrid (Spain), Cornell (USA), and Ohio State (USA).

CGIAR system linkages: Enhancement & Breeding (15%); Crop Production Systems (20%); Protecting the Environment (40%); Saving Biodiversity (5%); Strengthening NARS (20%). Co-convener with IBSRAM of Systemwide Program on Soil, Water & Nutrient Management (SWNM), and contributes to the Ecoregional Program for Tropical Latin America.

CIAT project linkages: Diversity in systems of Rhizobia and Mycorrhizae populations (SB-1), acid-soil adapted components received and adaptive attributes identified for compatibility in systems (IP-1 to IP-5), strategies to mitigate soil degradation (PE-5), and strengthening NARS via participation (SN-2).

Project PE-3: Hillsides

Project Description

Objectives: To improve standards of living and food security for hillside farmers in tropical America, and make their interaction with the environment more sustainable.

Outputs:
1. Improved production systems.
2. More sustainable landscapes.
3. Strengthened organizations.
4. Decision makers supported.
5. Efficient and participatory project management.

Gains: Farmers and locally organized farmers use technologies, tools, and methodologies developed by CIAT and its partners at the level of reference sites. Results are sustainable, production systems profitable, land use improved, and natural resources preserved at the landscape level. Partner organizations use technologies, tools, and methodologies developed by or with the project for their planning and activities at local, national, and regional levels. Decision makers at different levels have more information, tools, and methodologies provided by the project to support their planning, monitoring, and decisions.

Milestones:
2002 Sustainable and profitable production systems, improved land use, and natural resource preservation at the landscape level within reference sites. Decision makers at local, national, and regional levels use the project's results for their activities.
2003 Sustainable and profitable production systems, improved land use, and natural resource preservation on farms, spreading to the landscape beyond the reference sites. Decision makers at local, national, and regional levels use new results from the project for their activities.
2004 Landscapes in selected Central American watersheds transformed by sustainable systems, using CIAT's research results.

Users: Farming families and rural communities of the Andean and Central American hillsides. Project sites profit from increased community action aimed at sustaining the productivity of the resource base. As a result, off-site stakeholders benefit. National and international development organizations involved in priority setting and investments in development.

Collaborators: SDC, IDRC, DGIS, CIMMYT, CIP, IFPRI, IWMI, IICA, PASOLAC, CARE; universities of Florida, Wageningen, Edinburgh, Guelph, Nacional Agraria (Nicaragua), and CURLA (Honduras); DICTA, INTA, CONDESAN, CIPASLA, Campos Verdes, CLOs, CIALs; individual farmers.

CGIAR system linkages: CIMMYT and CIP.

CIAT project linkages: Collaboration with the Ecoregional Program for Tropical Latin America, soils (PE-2), land use (PE-4), smallholder systems (PE-5), agroindustries (SN-1), participatory methods (SN-3), forages (IP-5), and impact assessment (BP-1) projects.

Project PE-4: Land Use

Project Description

Objective: To improve policy and decision making for sustainable land and environmental management in Latin America through the scientific analysis of land and environmental patterns, anticipated dynamics, and improved policy indicators.

Outputs:

1. Extrapolation and upscaling tools developed for a variety of purposes related with rural development (i.e., germplasm targeting, plant and pest distribution, biodiversity collection).
2. Compilation and distribution of baseline and time series information of CIAT priority for the analysis of land use, and environmental patterns and dynamics.
3. Analyses of limitations and potential of land use in hillsides, savannas, and forest margins.
4. Frameworks developed for analyzing land use dynamics and for using sustainability indicators in the CIAT priority AES.
5. Policy-relevant, environmental, and sustainable indicators developed and defined.

Gains: Detailed georeferenced databases on land use, ecological, and socioeconomic factors. Environmental and sustainability indicators of land use. Networking on the environment, land use, sustainable agriculture, and indicators. A blend of theoretical, methodological, and field-based inquiry for decisions on sustainable agriculture. Upscaling and extrapolation tools available for various uses.

Milestones:

2002 Germplasm targeting tool completed (Beta version). World climate surfaces upgraded to 1-km grid. *Flora Map 2.0* released. *Dynamic Land Use Model* (Beta version) released. Indicators for sustainability at the municipality level published for Andean countries.

2003 Strategic databases on agricultural, environmental, social, and economic issues maintained and updated. Environmental and sustainability indicators routinely distributed to decision makers in the region at different levels. Remote-sensing information on land use changes in tropical America routinely collected and available for different purposes.

2004 Integrated GIS and mathematical models to support land management decisions by national organizations. National and local institutions from tropical America strengthened to use information, analysis, and tools. Data, analyses, and tools for NRM disseminated throughout tropical America and other tropical regions.

Collaborators: ICRAF, CIP, ILRI, ECLAC, Univ. of Guelph (Canada), IICA (Costa Rica), IILA (Italy), IIASA (Austria), WRI (USA), RIVM (the Netherlands), TCA, the Earth Council (Costa Rica), the World Bank. NARS, GOs, and NGOs in Latin America: DNP, IGAC, MinAmbiente, IDEAM, CARDER (Colombia); Ministry of the Environment, EMBRAPA (Brazil); IVITA, INIA (Peru); INIAP (Ecuador).

CGIAR system linkages: Protecting the Environment (60%); Improving Policies (20%); Enhancement & Breeding (10%); Saving Biodiversity (10%). Contributes to the Ecoregional Program for Tropical Latin America.

CIAT project linkages: GIS studies assist SB-1, SB-2, IP-1, and PE-2; model development with PE-3, PE-5, and BP-1.

Project SN-1: Agroenterprises

Project Description[1]

Objective: To develop methodologies for designing and establishing small-scale rural agroenterprises that link market opportunities and processing technologies with environmentally sound production practices.

Outputs:

1. Methods for identifying viable market opportunities that incorporate small-scale farmer selection criteria.
2. Decision-making tools and institutional models for designing and organizing rural agroenterprises chains and complementary support services.
3. Diagnostic and priority setting methods for establishing local capacity for postharvest technology development.
4. Information and tools for the selection and development of postharvest handling and processing technology of selected commodities with target communities.
5. National personnel trained in the design and execution of agroenterprise development projects.

Gains: Inhabitants of the Central American and Andean HS and FM gain enhanced capacity to establish small-scale agroprocessing enterprises. Linkages improved between conservation, production, added-value processing, markets, and consumers. Sustainable production practices catalyzed and adopted more widely. Through strategic alliances, experiences extended to Eastern and Southern Africa and Southeast Asia.

Milestones:

2002 At least three pilot production, processing, and marketing projects established in target regions.
Alliances and collaborative activities initiated in E and S Africa and ES Asia.

2003 Conceptual framework developed and methodological options defined for organizing and integrating production, processing, and market functions for the establishment and/or strengthening of rural agroenterprises.

2004 Case studies on rural enterprise development completed. Guidelines available for designing support services for rural agroenterprises.

Users: Immediate beneficiaries are the technical personnel of rural agroenterprise R&D organizations and rural policy markers. Ultimate beneficiaries are the inhabitants of rural areas, especially female small farmers, and entrepreneurs, who benefit from training and information on postharvest processing technologies, market analysis, and support services.

Collaborators: *Development of methods and technology components:* CIRAD, NRI, PRODAR-IICA (Peru), IDRC, CIP, IFPRI, and IITA. *Execution of pilot projects:* CIPASLA (Colombia), CLODEST (Honduras), and CODESU (Peru). *Training and networking:* PRODAR-IICA (Peru), members of the PhAction, CORPOICA, UNIVALLE, Fundación Carvajal, Universidad de los Andes.

CGIAR system linkages: Protecting the Environment (20%); Crop Production Systems (20%); Training (10%); Information (10%); Networks (10%); Organization and Management (30%).Participates in the Global Collaborative Post-Production Research Network and the Working Group on Root and Tuber Post-Harvest Technology and Marketing.

CIAT project linkages: Provides information on market opportunities in restricted ecosystems of PE-3 and PE-5. Information on agronomic adaptation and economic viability of specific crops provides by PE-3 and PE-5. Receives support from PE-4, SN-2, SN-3, and BP-1 in GIS tools, participatory methods, network development, and impact assessment.

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1. As presented in CIAT. 1998. *Doing Research Together: An Update of CIAT's Medium-Term Plan, 1999-2001*. Cali, Colombia. p. 22.

Project SN-3: Participatory Research

Project Description

Objective: To develop and disseminate participatory research (PR) principles, approaches, analytical tools, indigenous knowledge, and organizational principles that strengthen the capacity of R&D institutions to respond to the demands of stakeholder groups for improved levels of human well-being and agroecosystem health.

Outputs:

1. PR approaches, analytical tools, and indigenous knowledge that lead to the incorporation of farmers and other users' priorities in R&D agendas developed for interested institutions.
2. Organizational strategies and procedures for PR.
3. Professionals and others trained as facilitators of PR.
4. Material and information on PR approaches, analytical tools, indigenous knowledge, and organizational principles developed.
5. Impact of SN-3 activities documented.
6. CIAT projects and other institutions supported and strengthened in conducting PR.
7. Capacity of the SN-3 team strengthened.

Gains: Users involved at early stages in decisions about innovation development. Methods available for incorporating user preferences. Participatory methods applied on a routine basis in CIAT research. At least three LA universities with the capacity to teach PR methods. At least 1000 trainees and 40 trainers able to apply these methods in the region. Contribution of PR to technology adoption rates measured in restricted areas. Lessons learned, and methodologies and materials disseminated globally, jointly with the Systemwide Programme on Participatory Research and Gender Analysis for Technology Development and Institutional Innovation (SP-PRGA), convened by CIAT, and with the Farmer Participatory Research for the IPM project of the Systemwide Program on Integrated Pest Management (SP-IPM).

Milestones:

2002 Watershed organizational models replicated in at least two countries beyond the three pilot sites.
PPB approaches institutionalized in at least three NARS (one in each of Africa, Asia, and LAC) on a national scale. At least 15 CGIAR and NARS IPM project leaders trained in participatory approaches. Pilot organizational model for rural telecenters established at one site. Methods for PR on NRM at the landscape scale applied in at least one site.

2003 Associations of community-based farmer research services formed in at least four countries. Participatory projects for integrated management of AES health established in at least five CGIAR and NARS centers.

2004 CIAL approach validated in Africa. Methods for participatory agroenterprise development systematized and available for users. Seed enterprises established at village level in two African countries.

Users: This work will benefit poor farmers, processors, traders, and consumers in rural areas, especially in fragile environments. Farmer-researchers will have improved capacity for innovation. Researchers will receive more accurate and timely feedback from users about acceptability of production technologies and conservation practices. Researchers and planners will profit from methods for conducting adaptive research and implementing policies on natural resource conservation at the micro level.

Collaborators: NARS, NGOs, universities, SP-PRGA, SP-IPM.

CGIAR system linkages: Organization and Management (70%); Training (30%); Convenor of SP-PRGA; Coordinator of the FPR-IPM project of SP-IPM.

CIAT project linkages: Inputs to PE-1, PE-3, PE-4, PE-5, IP-1, IP-2, IP-3, IP-5, SN-1, and BP-1; outputs from PE-3, PE-4, IP-3, BP-1, and SN-1.

Project BP-1: Impact Assessment

Project Description

Objective: To generate and disseminate information and tools to improve the capacity of CIAT and partner organizations to allocate research resources efficiently.

Outputs:
1. Expected impact of future research estimated.
2. Impact of selected past CIAT research monitored.
3. Tools developed to assess the impact of research, *ex ante* and *ex post*.
4. Institutional capacity for estimating, monitoring, and evaluating research impacts improved.

Gains: Improved allocation of resources can increase the rate of return on investment in agricultural research. Project target is 2%.

Milestones:
2002 Study on research efficiency of molecular markers completed. Fieldwork for monitoring impact at Central American reference sites initiated. Economic impact of herbicide-resistant cassava estimated. Consumer attitude to food risks assessed in one country.
2003 Impact monitoring system developed and implemented for all agroecological sites and CIAT projects. Expected benefits of four CIAT research outputs appraised. Two new field studies on technology adoption and acceptability initiated. Two new field studies on technology adoption and acceptability completed.
2004 Two studies on technology adoption completed. Impact of investments in social capital on NRM estimated. Two new field studies on technology adoption initiated. Impact of CIAT research on poverty reduction estimated.

Users: Research planners in NARS and the CGIAR who make decisions on resource allocation. Stakeholders who need to measure expected returns to investment in agricultural and resource management research.

Collaborators: *Future impact of research:* Ministry of Agriculture (Colombia); CIAT projects on forages, rice, cassava, beans, Hillsides, Soils and CLAYUCA. *Impact of past research monitored*: Impact Assessment and Evaluation Group (CGIAR); Yale Univ.; Universidad Autónoma "Gabriel Rene Moreno" (Bolivia); CORPOICA (Colombia); Univ. of California—Berkeley; CNPMF (EMBRAPA, Brazil); Secretary of Rural Development (Ceará, Brazil); ARI (Tanzania); CIAT projects on beans, Beans for Africa, cassava, rice, forages, IPM, Hillsides, Land Use, and Agroenterprises. *Tools to assess impact*: IFPRI. *Institutional capacity*: COLCIENCIAS (Colombia); all CIAT projects.

CGIAR system linkages: Improving Policies (100%).

CIAT project linkages: All CIAT projects.

Project SW-1: Ecoregional Program for Tropical Latin America

Project Description

Objective: To enhance the effectiveness of research in tropical America by (1) improving the capacity to define and understand productivity and natural resource problems in agriculture and their relationships with rural poverty; (2) developing, adapting, and implementing suitable solutions to these problems through joint work with different partners at different levels; and (3) extrapolating results within and among AES.

Outputs:

1. Enhanced ability to undertake cross-country and AES analysis and to extrapolate results from reference sites.
2. Methodology for prioritizing and undertaking resource management research at the local (i.e., watershed) level.
3. Local consortia using research results to effectively address development problems at the local level.
4. National and regional consortia exchanging information and extracting lessons from their experience.
5. Improved capacities to self-assess impact and performance.

Gains: Effective impact on rural development achieved by local consortia. Enhanced capacity of regional consortia (CONDESAN network for the high Andes, Alternatives to Slash-and-Burn Agriculture Program in the forest margins, Central American Hillsides and the Savannas Consortium) to address AES problems. Strategic alliances among advanced, international, and national organizations (governmental, NGOs, grassroot) to solve specific problems will make more efficient use of complementary capacities and abilities. New models for partnerships will ensure that priority problems are addressed and experience is systematized and exchanged.

Milestones:

2002 Ecoregional consortia at all levels (local, national, regional) working actively. Extrapolation of activities validated at the ecoregional reference sites in progress.

2003 Decision tools developed for analyzing impacts of technology and policy across different scales. National capacity for AES research and action increased and active in the field in several regions.

2004 Joint ecoregional research and action mainstreamed. Impact assessment refined and mainstreamed.

Users: Researchers in the four consortia will have more complete information in AES research. Policy makers will have more useful tools for prioritizing research. National programs will have new models of partnership between stakeholders. Conservation and development organizations and projects will have access to experiences, lessons, tools, and methods resulting from research.

Collaborators: National organizations from tropical Latin America; international organizations (CATIE, CIAT, CIFOR, CIMMYT, CIP, CIRAD, ICRAF, ICRISAT, IFDC, IFPRI, ILRI, ORSTOM); PROCITROPICOS; and SROs from Germany, the Netherlands, and USA.

CGIAR system linkages: Protecting the Environment (40%), Saving Biodiversity (10%), Crop and Livestock Production Systems (25%), Training (5%), Organization and Management (10%), Improving Policies (10%). Linkages with systemwide programs: Alternatives to Slash-and-Burn Agriculture Program; Soils, Water & Nutrient Management; Livestock Programme; and SP-PRGA.

CIAT project linkages: Will receive input from all CIAT projects at the benchmark sites: forest margins (Pucallpa in Peru), hillsides (Honduras, Nicaragua, Colombia), and savannas (Puerto López in Colombia).

Project SW-2: Soil, Water & Nutrient Management

Project Description

Objective: To contribute to long-term increases in agricultural productivity, poverty reduction, and to the conservation and enhancement of land and water resources.

Outputs:

1. Economically viable SWNM technologies that are socially acceptable and ecologically sound.
2. Improved methods and diagnostic tools for PR.
3. Indicators to monitor the environmental and economic impact of land use systems.
4. Decision support systems, such as models and GIS, for generating and extrapolating options.
5. Stronger institutional capacity to implement SWNM programs and policies.
6. A framework for partnerships between stakeholder groups.
7. Information on appropriate policies to promote sustainable practices.

Gains: Linkages of research on SWNM at key sites within the CGIAR ecoregional programs. Improved research efficiency through collaboration among NARS, IARCs, and SROs through capacity building. Avoidance of duplication of efforts in SWNM and increased rate of technology development. A core group of resource management scientists. Accelerated scientific progress through sharing of experience, common methods, databases, and models across regions. Strengthened research projects already in place through an integrated approach. Complementation of ongoing research where knowledge gaps exist and provision of new knowledge is required to improve NRM worldwide.

Milestones:

2002 Guidelines available for optimizing soil water use. Water and nutrient fluxes determined in watersheds under different land use management practices. Recommendations available for NRM in areas of high risk of land degradation.

2003 Validation of soil quality indicators. Cadre of local scientists, farmer groups, and extension workers trained to develop local solutions to SWNM constraints in the four consortia.

2004 Independent community-based investigations established by four consortia in benchmark areas. Technologies for soil improvement established in two sites.

Users: Farmers and other land users, NARS, extension workers, NGOs, and community-based groups.

Collaborators: IARCs (TSBF, IBSRAM, IFDC, ICRISAT, ICARDA, IITA, ICRAF, ORSTOM); NARS, universities, and AROs of the four SWNM consortia.

CGIAR system linkages: Saving Biodiversity (5%), Increasing Productivity (35%), Protecting the Environment (35%), Strengthening NARS (15%), Improving Policies (10%).

CIAT project linkages: Confronting soil degradation (PE-2); watershed resource management (PE-3); land use studies (PE-4); smallholder systems (PE-5); and participatory methods (SN-3).

Project SW-3: Participatory Research and Gender Analysis

Project Description

Objective: To assess and develop methodologies and organizational innovations for gender-sensitive participatory research (PR), and operationalize their use in plant breeding (PB), and crop management and NRM.

Outputs:
1. Methods for PPB developed.
2. Methods for PR on NRM developed.
3. Gender-sensitive methodologies suitable for pre-adaptive PR developed.
4. Evaluation and functioning of innovations for institutionalizing participatory approaches.
5. Innovative approaches to capacity building functioning.
6. New partnerships among the IARCs, NARS, NGOs, and farmer groups developed.

Gains: Accelerated learning from existing experience and generation of new, widely applicable, methodologies for pre-adaptive PR and GA. The CGIAR and NARS will access a worldwide exchange of expertise on PR and GA among a wide range of institutions. Considerable savings and increased impact from NARS generated by better designed technologies. Indigenous systems of crop development and NRM will be strengthened and integrated in a mutually reinforcing way with formal research. Poor rural women will be important participants in and beneficiaries of research. The development and adoption of diverse germplasm will be greatly accelerated in major food crops.

Duration: Five years.

Milestones:

2002 Guidelines prepared on methods for scaling up NRM options and participatory NRM methods. Ten experiments conducted and evaluated on how resource user and research experimentation fit together. A comparison of costs and benefits in participatory NRM compiled and published as a working paper. Synthesis and case studies on the effectiveness of GA and methods for including different users across technology development in PB and NRM published.

2003 Published guidelines on the costs and benefits of different approaches to involving and targeting differentiated users. Guidelines for PR and GA methods and strategies in NRM published. Three case studies of organizational change for improving the effective participation of different stakeholders completed and synthesized. The costs and benefits of including PB and NRM in GA assessed.

2004 At least three CGIAR centers with partners incorporate PPB into core (mainstream) PB programs. At least two CGIAR centers incorporate participatory methodologies resulting from the program's work into their NRM research.

Users: Poor rural women farmers, poor farmers in general, CGIAR centers, NARIs, NGOs, and rural grassroot organizations.

Collaborators: IARCs, NARS, NGOs, grassroot organizations, universities.

CGIAR system linkages: Enhancement & Breeding (25%); Crop and Livestock Production Systems (25%); Protecting the Environment (30%); Strengthening NARS (100%), that is, Training (40%), Organization and Management (20%).

CIAT project linkages: SB-1, IP-2, IP-3, PE-2, SN-3, and BP-1.

Tropical Fruits: A High Income Generating and Soil Conservation Alternative for Small Holder Farmers[2]

Project Description

Objective: To contribute with partners to the well-being of small farmers in Latin America and the Caribbean by resolving prioritized production and marketing constraints of selected tropical fruit species.

Strategy: As there are well over 2000 different fruit species in the tropics, CIAT cannot attend to all, neither will it prioritize among them. In stead, CIAT will support national research based on their set priorities. Research will focus on, but not be limited to, four main areas: (1) market intelligence, (2) characterization and geographic mapping for production, (3) IPM, and (4) support through rural agricultural enterprises.

Outputs:

1. An integrated research strategy for tropical fruits at national and regional level.
2. Pest and disease resistant germplasm and integrated crop management strategies for selected fruits.
3. Disease and virus free planting material available for selected species.
4. Low cost rapid propagation systems available for selected fruit species.
5. Validated recommendations for fruit production chains, linking small holders to growth markets.
6. Methods and tools for quality assurance developed for selected fruits chains.

Gains: Tropical fruit production is labor intensive and can provide steady and high income particularly to organized small farmers. Their long production cycle reduces soil erosion. This project will help make available to farmers, particularly to organized farmer groups, improved germplasm and integrated management strategies that will encourage stable production in a safe and sustainable way, as well as market options for their produce.

Milestones:

2001 CIAT will have developed a fruit research strategy, which is integrated with and complementary to other national and regional efforts. The strategy will be based on the Center's comparative advantage vis a vis partners and other research suppliers, and will outline those species and problems/opportunities that CIAT will focus on.

2002 Anthracnose in cool season fruits has been characterized and pathogen variability determined. A pilot project on certification of fruit germplasm will be in place and a proposal has been forwarded to the relevant authorities for certification programs.

2003 Resistant germplasm of two fruit species is under commercial field testing. Case studies on the formation of small and medium level of fruit agro-enterprises and their integration with the market will be available. Low cost, rapid propagation system developed for selected species.

2004 Field testing of transgenic material under biosafety conditions is underway. Integrated crop management practices will be tested by farmers to control two important production constraints using participatory methods.

Users: Small holder farmers, will be the main beneficiaries. Farmers organized in associations or cooperatives will benefit most.

2. Fruit MTPlan, AvS, 19-11-01.

Collaborators: Collaborators will include Corporación Biotec, IPGRI, PROCIANDINO, national research organizations (Corpo-ica, ICA, Universities, NGOs, the private sector: producers, processors and exporters). Advanced research organizations will provide technical backstopping.

CGIAR system linkages: Enhancement and breeding (30%), crop production systems (25%), protecting the environment (25%), organization and management (20%).

CIAT Project linkages: Genetic Resources (SB-1), biotechnology (SB-2), Rural Agro-enterprises (SN-1), Hillsides (PE-3) and Integrated Pest Management (PE-3).

Desirability and Feasibility of the Proposed Project

Consistency with the CIAT mission: This project is highly consistent with CIAT mission as it targets the rural poor and protection of the environment through soil conservation. Both are the key elements of the CIAT mission.

Fundability: Fruit research is highly fundable with the Colombian government and funding organizations, such as Colciencias and ASOHOFRUTAS. In the donor meeting during ICW 2000 donors have expressed a high level of interest, but CIAT has not submitted as yet funding proposals on tropical fruits to the traditional donors as it would compete with existing projects. Governments from Andean countries have not been approached either.

CIAT competence: CIAT has over the past 25 years accumulated a wealth of experience in crop research, elements of which are highly relevant to tropical fruits. This project seeks to apply the existing CIAT competencies such as IPM, plant breeding and biotechnology, agro-enterprise formation, soils, GIS, etc. to tropical fruits. Thus competencies acquired with beans, cassava, etc are given a broader application to include tropical fruits.

Alternative suppliers: There are many alternative supplier in tropical fruit research. These focus mainly on agronomy and marketing, but are working in an uncoordinated manner. To assure that this project will exploit the specific comparative advantages of CIAT and respond to demands from growers and industry, the first activity of the project will be to develop, jointly with other suppliers, growers and industry, a strategy for CIAT on tropical fruits. This will be the first outcome of the project. This will initially focus on Colombia to be expanded to neighboring Andean countries.

Confronting Global Climate Change for the Benefit of Tropical Agriculture

Project Description

Justification: Since the beginning of the industrial revolution, atmospheric concentrations of the so called greenhouse gases (GHG), have increased rapidly. This had resulted in steady increases in global mean temperatures which are affecting the planetary climate. The recently updated Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) forecast that the "globally averaged surface temperature is projected to increase by 1.4 to 5.8 °C over the period 1990 to 2100." (IPCC, 2001). Other scenarios taking account of feed-forward responses in models that couple terrestrial and oceanic responses to increasing greenhouse gas (GHG) concentrations in the atmosphere, forecast as much as 3 °C increase in average temperatures by 2020 (Cox et al., 2000). Temperature changes of this magnitude in addition to expected changes in precipitation patterns in many regions of the world, will profoundly affect the suitability of lands for agriculture, the performance of current cultivars of food crops as well as the incidence of diverse pests and diseases. The effects of climate change will be specially adverse for populations in developing countries (IPCC, 2001). All projections indicate a net decline in food productivity in most of the poor regions of Africa, Southeast Asia and Latin America as a result of climate change which is characterized by varying and prolonged periods of water shortages and excesses together with heat stress. These conditions will also trigger higher incidence of current pests and diseases and the appearing of new ones affecting the performance of several food cultivars. As an example, the soil borne pathogen *Macrophomina phaseolina* which devastates crops of beans, soybeans sorghum and edible legumes, is favored and enhanced by combinations of heat stress and drought (REF). Climate change is expected to reduce the availability of water for human and crop consumption in areas already dry such as Sub-Saharan Africa and to decrease the water storage capacity of high altitude ecosystems which provides water for large populations in the Andes.

Without timely actions, the goal of feeding a fast growing world population, largely concentrated in such regions of the globe, is at high risk.

A need for adaptation. Tropical Agriculture is obligated to accommodate to the changing environment. Some questions demand urgent consideration. For example, should breeding be directed towards quantitative traits such as drought tolerance, high temperature tolerance, and enhanced resistance to pests and diseases, or will the stresses be so strong that development of short-season varieties that could avoid drought stress and tolerate higher temperatures is the only possibility? The task is urgent given that the lead-time for producing new crop varieties is of at least ten years. There is also an urgent need to develop production systems that can cope with increasing climate variability.

Some hopes for mitigation. Agriculture is an important source of and a potential sink for CO_2, CH_4 and N_2O, some of the most important GHG's. Livestock, particularly ruminants, contribute about 1/6 of the total flux of methane to the atmosphere (Moss, 1993). Alternative strategies for feeding ruminants that reduce their net methane emissions per unit of product are clearly required. Of the 7.9 Gt C yr^{-1} released to the atmosphere from anthropogenic sources during the period 1990-1998, land use change (LUC), particularly forest clearing in the tropics, accounts for about 20% (IPCC, 2000). Uptake in terrestrial systems was 3.0 Gt C yr^{-1} (38% of all C emissions). By 2010 terrestrial uptake due to LUC and improved management without LUC could account for the uptake of a further 1.0 GtC yr^{-1} (13%) (IPCC, 2001). There are in consequence some avenues where improvements to land use and management systems could contribute to mitigate the atmospheric build-up of GHG's.

Objective: Confront GCC with a multi-pronged strategy including research on impact, adaptation and mitigation of climate change for CIAT-mandated crops and provide information to other Centers for their mandated crops:

- Predict the *impact* of GCC scenarios (derived from General Circulation Models), on productivity of major food crops in several agroecological regions in the tropics. The outputs from the MarkSim computer model (developed by CIAT scientists), which simulates daily rainfall distribution, will be coupled to the DSSAT crop growth models to forecast how probabilities of given yield levels will change in response to increasing temperatures and less and more variable rainfall.
- Predict the *impact* of GCC on disease ecology within CIAT-mandated crops and provide information to other centers for their mandated crops.
- Estimate the impact of CCG on water availability for rural and urban communities in the Andean highlands. Assess expected reductions in availability of land for high altitude crops.
- Develop crop/forage components with specific *adaptation* to stress, for example, buffering production systems by means of developing germplasm tolerant to heat and drought stress and tolerant to specific pests or diseases (i.e. bean varieties tolerant to drought and resistant to *M. phaseolina*).
- Develop *mitigation* strategies, for example: minimizing emissions of GHG's and maximizing C sequestration by pastures/crop rotations/minimum tillage; use of multi-purpose trees that could also be used as biofuels; modify feeding strategies for ruminants to manipulate ruminal fermentation and reduce methane production.
- Determine current and estimate future global warming potential (GWP) for key agroecosystems in the tropics to improve national inventories of GHG's and enable policy makers to include environmental services in the development plans for specific eco-regions (i.e. tropical savannas, forest margins, hillsides, drylands, highlands).
- Increase farmers' *adaptive capacity* to cope with the consequences of GCC by defining likely future scenarios, developing effective strategies and decision support training to deal with them.

Outputs:

- Maps of probabilities of yield levels in CGIAR-mandated and other food crops in the face of various climate change scenarios and time scales derived from GCM's. Analysis of how agricultural production systems will change in various agroecosystems in response to global change challenges.
- Maps of pests and diseases incidence under various scenarios of future climate for key tropical agroecoregions.
- Expected reduction in water supply known for urban and rural communities in Andean Hillsides.
- Physiological consequences defined on CGIAR-mandated crops under various GCC scenarios and hence defined objectives for breeding them to confront climate change.
- New crop varieties developed with resistance to high temperature, drought tolerance and enhanced resistance to specific diseases.
- Mitigation strategies defined, including minimized GHG emissions and enhanced carbon sequestration in sustainable pasture and cropping systems.
- Strategies developed enabling farmers to include multipurpose species within their farming practices to be used as biofuels.
- Information on methane emission from rumen fermentation and suitability of alternative feeding strategies to reduce methane emission per unit of animal product.
- Integrated GWP calculated for key agroecosystems in the tropics under current conditions and estimated for 20 and 50 years scenarios.
- Information and decision support strategies developed with farmers and in place to be extrapolated and scaled up.

Gains:

- *Plant breeders* and *agronomists* will have realistic and detailed definitions of the climates that will be encountered in response to GCC.
- *Farmers* and *consumers* of CGIAR-mandated and other food crops will have varieties adapted to marked changes in temperature and water stress conditions.
- *Farmers* will have informed decision capacity and sustainable systems that minimize GHG emissions (CO_2, CH_4, and N_2O) and maximize carbon sequestration for international carbon trading.
- *Policy makers* will have information of the extent of GCC on the performance of CGIAR-mandated and other food crops and possible changes required to confront it and avoid wide-spread land degradation.
- *National governments* will have more accurate information on emissions of GHG's by sources and removal by sinks for incorporation in their annual inventories under the Article 7 of the Kyoto protocol.

Milestones: (assuming that the project starts in 2002)

2003 Preliminary definition of the near-term effect (20-year) effect of GCC on CGIAR-mandated and other food crops where they are currently grown (what will happen if everything stays put). Indications of the physiological consequences of near-term GCC and the implications for plant breeding objectives. Carbon sequestration defined under a limited range of crop and pasture options.

2004 Starting estimates of where wild relatives of our crop germplasm will move and estimates of the influence on biodiversity. Estimates of the effects on *in-situ* germplasm.

2005 Preliminary estimates of what agriculture will look like in 20 and 50 years time, in terms of crop species distribution. This will require the development of sophisticated land use models to investigate the potential movement of crops under new environmental conditions. Preliminary estimates of social and economic consequences of global warming on the rural population. Human and livestock health effects linked to land use problems. More precise definition of plant breeding objectives. Definition of carbon sequestration and methane emission under a broader range of crop and pasture options.

2006 More refined estimates of what agriculture will look like and answers to questions such as where will the crops move? Where will the pests move? Interactive refinement of plant breeding objectives. Definition of carbon sequestration and methane emission under a further broadened range of crop and pasture options.

2007 Farmers, policy makers and other stakeholders acting at different scales informed, supported and applying the outputs of the project.

2008 And beyond?

Users: The immediate beneficiaries are farmers that grow CGIAR-mandated crops and the people that consume them, especially poor farmers in developing regions. Policy makers will use the information on predicted changes in climate to plan land use and to include environmental services as part of the development agenda for selected regions.

Collaborators: NARS and National Research Centers: Brazil (EMBRAPA, INPE, INPA); Colombia (CORPOICA, Instituto Von Humboldt, Cinchi, Universidad Nacional), Ecuador (? Universidad Nacional ...), Venezuela (INIA, IVIC), Peru (Universidad la Molina, ...), Central America (.....); CGIAR germplasm Centers; ILRI; Advanced Research institutions: (Cornell University, US; University of Zurich, Switzerland, Bayreuth University, Germany); Climate change modelers (e.g., Hadley Climate Center. UK; NCAR, US); international and local NGOs; farmers' and community organizations.

CGIAR system linkages: Protecting the Environment (50%); Improving Productivity (20%); Training (10%); Information (10%); Networks (10%). Participation in the Inter-Centers' Working Group on Climate Change.

CIAT project linkages: IP1-IP3, PE1, PE2, PE5, SN2, SN3.

Project Characteristics

Consistency with CIAT mission

- ***Avoiding crop failures and providing food security to resource poor farmers.***
- Mitigating resource degradation through improved carbon sequestration in soil.
- In the current environment within the CGIAR, GCC is becoming increasingly important. GCC is being included in CIAT's Strategic Plan 2001-2010. This project is an early proposal congruent with this new approach and with CIAT's mission and would be included as part of the CGIAR Global Challenge Program on Climate Change. CIAT strategy focuses on the necessity to cope with food security and to protect the global environment through the use of sound science and exploiting the center's specific competence.

CIAT competence: As a result of more than three decades of plant breeding and research on tropical agriculture and more recent initiatives on global climate change, besides its unique germplasm collections, CIAT already has available the capacity and background information to move ahead with this new challenge. Of paramount importance will be CIAT expertise in human dominated ecosystems and its access to representative research sites throughout the developing world, as well as its well established research networks with NARES, Universities, NGO's and ARI's.

CIAT scientists developed the MarkSim model which simulates daily rainfall distribution. This information can be incorporated into available crop models to forecast how crop yields will respond to increased temperatures and more variable rainfall. Application of these tools have shown that wild relatives of *Arachis pintoi*, an important forage legume for tropical savannas, will be unable by their own means to find suitable areas where to migrate once its original sites of origin becomes too warm/dry.

CIAT's plant breeding programs have developed cultivars with improved adaptation to drought, particularly cassava and common bean. In less than two years CIAT could release a bean variety with great drought resistance especially adapted to the low fertility hillsides of Central America. Research is in progress to combine drought adaptation to low fertility for Brachiaria hybrids and various forage legumes.

CIAT in collaboration with Cornell University has carried out the first inventory of GHG in tropical savannas. The role of deep-rooted grasses in sequestering noticeable amounts of atmospheric carbon, discovered by CIAT scientist in 1994, has being confirmed in this research as a key component to control the overall global warming potential of this ecosystem. Similar studies are going to be developed for other globally important agroecosystems.

Several management strategies have been identified that minimize GHG emissions and or increase carbon sequestration. Some of them include the use of improved forage-legume pastures, crop rotations, improved fallows, minimum tillage, planting of multipurpose species that could be also used as biofuels, modifying feeding strategies for ruminants to reduce methane production etc. Matching these practices with site specific environmental conditions should result in net gains in equivalent C uptake which could be traded within

the recently approved international carbon trading mechanism. Funds from C trading are expected to be key for the implementation of programs to rehabilitate degraded lands, watershed protection and sustainable land use among others.

CIAT is collaborating with the University of Zurich, Switzerland in an SBZ-funded project to identify alternatives to reduce methane emissions in ruminants through improved feed resources.

In the last five years, as a result of a strong program in participatory research, CIAT has developed a set of tools that allow small scale farmers to estimate the risk of their land to soil erosion, and to have indicators of sustainability to be used in decision support systems. The addition of predictive tools for the adaptability of their crops and land to variable climates will permit an increase in the adaptive capacity of small scale farmers of poor regions of the globe, to cope with the consequences of GCC and will minimize the risks of *crop failures* and will provide *food security to resource poor farmers* in large areas densely populated.

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Information for Rural Development: Knowledge Sharing and Rural Communities

Project Description

Objective: To develop new approaches by which rural people and organizations strengthen their capacity to obtain, adapt, and share knowledge-intensive technologies that contribute to sustainable rural livelihoods.

Outputs:

- Organizational models (e.g., community telecenters) for integrating modern information and communications technologies (ICTs) with informal knowledge-sharing networks.
- Gender-sensitive methods for characterizing information needs, improving neglected groups' access to knowledge-intensive technologies, gauging the impacts of better information and knowledge access in rural areas, and channeling feedback to technology providers.
- Web-based information systems dealing with themes such as participatory plant breeding, integrated pest management (IPM), agroenterprise development, integrated soil nutrient management, and land use planning.
- Training in new knowledge-sharing approaches and in information systems development.
- Electronic networks of users of new knowledge-intensive technologies in rural communities.

Gains: Marginalized groups in rural communities will gain better access to knowledge-intensive technologies that help them address challenges in agricultural production and natural resource management. Local organizations will be better able to provide development services to clients and convey feedback about new technologies to national and international research institutions.

Milestones:

2003 Organizational models and gender-sensitive tools refined.
2004 Five Web-based information systems developed and feedback mechanisms established.
2005 CIAT's training capacity and materials developed and electronic networks of technology users created.

Users: The immediate beneficiaries are local organizations (e.g., farmer associations, NGOs, municipal governments, and schools) that acquire new information and communications skills. As telecenters and other organizational models integrate new ICTs with conventional communications media (such as local radio) as well as informal knowledge-sharing networks, a much broader segment of the rural population will gain improved access to knowledge-intensive technologies.

Collaborators: CONDESAN in the Andean zone and CATIE in Central America. Developing country universities, including the Corporación Universitaria Autónoma de Occidente in Colombia, Universidad de San Simón in Bolivia, Escuela Agrícola Panamericana (Zamorano) in Honduras, and Universidad Nacional Agraria in Nicaragua. Consortia of local organizations in the project's focus sites. Communications NGOs, such as Colnodo in Colombia and Fundación Chasquinet in Ecuador. Public and private providers of telecommunications services.

CIAT project linkages: Provides all Center projects with a new option for increasing the development impact of knowledge-intensive technologies. While focusing initially on tropical America, the project would actively pursue opportunities to strengthen the community knowledge-sharing dimensions of CIATs work in Africa and Asia.

Desirability and Feasibility of the Project

Consistency with CIAT's mission: Over the last decade, the Center has broadened its research to include new projects aimed at reducing poverty and improving natural resource management. The technologies developed by these projects tend to be knowledge-intensive, since they are designed to influence decision making about complex tasks in rural communities, including participatory plant breeding, integrated pest management (IPM), agroenterprise development, integrated soil nutrient management, and land use planning. In order for new knowledge-intensive technologies to have development impact, CIAT projects and their partners need more effective approaches by which rural people and organizations can strengthen their capacity to obtain, adapt, and share such technologies. A CIAT project bringing new Web-based tools to bear on this task at the local level is therefore not only consistent with the Center's mission but necessary for fulfilling it.

Fundability: CIAT currently receives a modest amount of funding from IDRC and the Rockefeller Foundation for two complementary projects dealing with community telecenters. Several years ago, the Center's Library and Documentation Unit carried out a project on grey literature with support from the Kellogg Foundation. The Center also has a project on GIS for Central America with the InfoDev Program at the World Bank. These experiences demonstrate that Center staff can obtain funds for projects focusing on information and communications.

A more ambitious fund-raising strategy for a project on knowledge sharing and rural communities could be aimed at:

- Bilateral windows of major aid agencies giving high priority to particular countries of the Andean Zone, Central America, eastern Africa, and Southeast Asia.
- Donors already supporting CIAT's work on participatory plant breeding, IPM, agroenterprise development, integrated soil nutrient management, and land use planning.
- Information/communications windows of other traditional CGIAR donors (e.g., the Rockefeller Program's new initiative on communications for social change).
- Nontraditional donors interested in communications and information.

CIAT competence: The Center already has considerable capacity in the thematic areas mentioned above (IPM, etc.) It also has many of the talents and tools required to develop Web-based knowledge systems. A key challenge would be to wed this expertise with a capacity to strengthen information and communications capacities at the community level. The Center has made a start in this direction by undertaking the above-mentioned telecenter initiatives.

Alternative suppliers: Many organizations (from NGOs to large public/private partnerships) are working at the national level to democratize access to modern ICTs. Various international institutions (notably IDRC) are also actively engaged in this area. Within agricultural R&D, some institutions (such as IICA) are working to improve the supply of relevant information in electronic form for development professionals. But relatively few agricultural research institutions are publishing development-oriented information electronically while at the same time developing telecenters or other organizational models for getting knowledge-intensive technologies into the hands of rural people and for channeling feedback on these technologies to researchers. This project thus represents a unique opportunity for CIAT to build stronger links between R and D.

Appendix II

Financial Tables
2002-2004

Table 1. CIAT - Cost Allocation: Financial Requirements by CGIAR Outputs, 2002 (expenditure in $ million).

Center Projects	Germplasm Improvement	Germplasm Collection	Sustainable Production	Policy	Enhancing NARS	PROJECT TOTALS
SB3 Fruits	0.114	0.000	0.229	0.000	0.114	**0.457**
SB2 Agrobiodiversity	1.754	1.276	0.000	0.000	0.159	**3.190**
IP1 Beans	2.894	0.000	0.579	0.000	0.386	**3.858**
IP3 Cassava	1.148	0.574	0.344	0.000	0.230	**2.295**
IP4 Rice	1.400	0.467	0.233	0.117	0.117	**2.333**
IP5 Forages	0.930	1.241	0.620	0.000	0.310	**3.101**
PE1 IPM	0.000	0.307	1.074	0.000	0.153	**1.534**
PE2 Restoration of Degradaded Lands	0.383	0.128	1.533	0.000	0.511	**2.554**
PE3 Hillsides Watersheds	0.000	0.130	1.686	0.519	0.259	**2.594**
PE4 Land Management	0.141	0.141	0.848	0.283	0.000	**1.413**
GCP Climate Change	0.000	0.000	0.815	0.000	0.144	**0.958**
SN1 Small Scale Agroenterprises	0.000	0.000	0.371	0.000	0.556	**0.927**
SN2 Information for Development	0.000	0.000	0.000	0.000	1.616	**1.616**
SN3 Participatory Research	0.283	0.000	0.566	0.000	0.283	**1.133**
BP1 Impact Assessment	0.000	0.000	0.000	0.800	0.000	**0.800**
SW: Ecoregional Latin America	0.000	0.020	0.140	0.020	0.020	**0.200**
SW-SWNM Soil Water & Nutrient Management	0.000	0.000	0.485	0.061	0.061	**0.606**
SW-FPR/GA Farmer Participatory Research	0.398	0.000	0.875	0.000	0.318	**1.590**
TSBF: Pending	0.000	0.000	0.000	0.000	0.000	**0.000**
UNDERTAKING TOTALS	**9.445**	**4.282**	**10.397**	**1.799**	**5.237**	**31.160**

Table 2. CIAT - Cost Allocation: Allocation of Resources by CGIAR Outputs and CGIAR Activities, 2002-2004 (expenditure in $ million).

Outputs:	2002 (proposal)	2003 (plan)	2004 (plan)
Germplasm Improvement *(Activity: Germplasm Enhancement & Breeding, plus Networks, as appropriate)*	9.445	9.445	9.445
Germplasm Collection *(Activity: Saving Biodiversity, plus networks, as appropriate)*	4.282	4.282	4.282
Sustainable Production *(Activity: Production Systems Dev & Mgmt, Protecting the Environment and Networks, as appropriate)*	10.397	10.397	10.397
Policy *(Activity: Improving Policies, plus Networks, as appropriate)*	1.799	1.799	1.799
Enhancing NARS *(Activity: Strengthening NARS - the three sub-activities, plus Networks, as appropriate)*	5.237	5.237	5.237
TOTAL	31.160	31.160	31.160

Activities:	2002 (proposal)	2003 (plan)	2004 (plan)
Increasing Productivity	13.455	13.455	13.455
of which:			
Germplasm Enhancement & Breeding	9.445	9.445	9.445
Production Systems Development & Management	4.009	4.009	4.009
Protecting the Environment	6.387	6.387	6.387
Saving Biodiversity	4.282	4.282	4.282
Improving Policies	1.799	1.799	1.799
Strengthening NARS	5.237	5.237	5.237
of which:			
Training and Professional Development	1.427	1.427	1.427
Documentation, Publications, Info. Dissemination	1.441	1.441	1.441
Organization & Management Counselling	0.594	0.594	0.594
Networks	1.775	1.775	1.775
TOTAL	31.160	31.160	31.160

Table 3. CIAT - Cost Allocation: Project & Output Cost Summary, 2002-2004 (in $ million).

	2002 (proposal)	2003 (plan)	2004 (plan)
SB3 Fruits	0.457	0.457	0.457
SB2 Agrobiodiversity	3.190	3.190	3.190
IP1 Beans	3.858	3.858	3.858
IP3 Cassava	2.295	2.295	2.295
IP4 Rice	2.333	2.333	2.333
IP5 Forages	3.101	3.101	3.101
PE1 IPM	1.534	1.534	1.534
PE2 Restoration of Degradaded Lands	2.554	2.554	2.554
PE3 Hillsides Watersheds	2.594	2.594	2.594
PE4 Land Management	1.413	1.413	1.413
GCP Climate Change	0.958	0.958	0.958
SN1 Small Scale Agroenterprises	0.927	0.927	0.927
SN2 Information for Development	1.616	1.616	1.616
SN3 Participatory Research	1.133	1.133	1.133
BP1 Impact Assessment	0.800	0.800	0.800
SW: Ecoregional Latin America	0.200	0.200	0.200
SW-SWNM Soil Water & Nutrient Management	0.606	0.606	0.606
SW-FPR/GA Farmer Participatory Research	1.590	1.590	1.590
TSBF : Pending	0.000	0.000	0.000
Total	**31.160**	**31.160**	**31.160**

Summary by Undertaking:

	2002 (proposal)	2003 (plan)	2004 (plan)
Increasing Productivity	13.455	13.455	13.455
Protecting the Environment	6.387	6.387	6.387
Saving Biodiversity	4.282	4.282	4.282
Improving Policies	1.799	1.799	1.799
Strengthening NARS	5.237	5.237	5.237
Total:	**31.160**	**31.160**	**31.160**

Summary by Output:

	2002 (proposal)	2003 (plan)	2004 (plan)
Germplasm Improvement	9.445	9.445	9.445
Germplasm Collection	4.282	4.282	4.282
Sustainable Production	10.397	10.397	10.397
Policy	1.799	1.799	1.799
Enhancing NARS	5.237	5.237	5.237
Total:	**31.160**	**31.160**	**31.160**

Table 4. CIAT - Cost Allocation: Allocation of Project Cost to CGIAR Activities, 2002-2004 (in $ million).

Project	Activity	2002 (proposal)	2003 (plan)	2004 (plan)
01. Fruits	Enhancement and Breeding (Fruits)	0.114	0.114	0.114
	Production Systems (Fruits)	0.114	0.114	0.114
	Protecting the Environment	0.114	0.114	0.114
	Strengthening NARS--Training	0.046	0.046	0.046
	Strengthening NARS--Information	0.023	0.023	0.023
	Strengthening NARS--Org & Mgt	0.023	0.023	0.023
	Strengthening NARS--Networks	0.023	0.023	0.023
		0.457	0.457	0.457
02. Agrobiodiversity	Enhancement and Breeding (Bean)	0.526	0.526	0.526
	Enhancement and Breeding (Cassava)	0.526	0.526	0.526
	Enhancement and Breeding (Rice)	0.526	0.526	0.526
	Enhancement and Breeding (Livestock)	0.175	0.175	0.175
	Saving Biodiversity	1.276	1.276	1.276
	Strengthening NARS--Training	0.128	0.128	0.128
	Strengthening NARS--Information	0.032	0.032	0.032
		3.190	3.190	3.190
03. Beans	Enhancement and Breeding (Bean)	2.894	2.894	2.894
	Production Systems (Bean)	0.386	0.386	0.386
	Protecting the Environment	0.193	0.193	0.193
	Strengthening NARS--Training	0.154	0.154	0.154
	Strengthening NARS--Information	0.039	0.039	0.039
	Strengthening NARS--Networks	0.193	0.193	0.193
		3.858	3.858	3.858
04. Cassava	Enhancement and Breeding (Cassava)	1.148	1.148	1.148
	Production Systems (Cassava)	0.230	0.230	0.230
	Protecting the Environment	0.115	0.115	0.115
	Saving Biodiversity	0.574	0.574	0.574
	Strengthening NARS--Training	0.078	0.078	0.078
	Strengthening NARS--Networks	0.151	0.151	0.151
		2.295	2.295	2.295
05. Rice	Enhancement and Breeding (Rice)	1.400	1.400	1.400
	Production Systems (Rice)	0.117	0.117	0.117
	Protecting the Environment	0.117	0.117	0.117
	Saving Biodiversity	0.467	0.467	0.467
	Improving Policies	0.117	0.117	0.117
	Strengthening NARS--Training	0.047	0.047	0.047
	Strengthening NARS--Information	0.023	0.023	0.023
	Strengthening NARS--Networks	0.047	0.047	0.047
		2.333	2.333	2.333
06. Forages	Enhancement and Breeding (Livestock)	0.930	0.930	0.930
	Production Systems (Livestock)	0.465	0.465	0.465
	Protecting the Environment	0.155	0.155	0.155
	Saving Biodiversity	1.241	1.241	1.241
	Strengthening NARS--Training	0.155	0.155	0.155
	Strengthening NARS--Information	0.031	0.031	0.031
	Strengthening NARS--Networks	0.124	0.124	0.124
		3.101	3.101	3.101
07. IPM	Production Systems (Cassava)	0.460	0.460	0.460
	Protecting the Environment	0.614	0.614	0.614
	Saving Biodiversity	0.307	0.307	0.307
	Strengthening NARS--Networks	0.153	0.153	0.153
		1.534	1.534	1.534
08. Restoration of Degradades Lands	Enhancement and Breeding (Beans)	0.077	0.077	0.077
	Enhancement and Breeding (Cassava)	0.096	0.096	0.096
	Enhancement and Breeding (Rices)	0.077	0.077	0.077
	Enhancement and Breeding (Livestock)	0.134	0.134	0.134
	Production Systems (Rice)	0.153	0.153	0.153
	Production Systems (Livestock)	0.358	0.358	0.358
	Protecting the Environment	1.022	1.022	1.022
	Saving Biodiversity	0.128	0.128	0.128
	Strengthening NARS--Networks	0.511	0.511	0.511
		2.554	2.554	2.554
9. Hillsides	Production Systems (Bean)	0.032	0.032	0.032
	Production Systems (Cassava)	0.032	0.032	0.032
	Production Systems (Livestock)	0.065	0.065	0.065
	Protecting the Environment	1.556	1.556	1.556
	Saving Biodiversity	0.130	0.130	0.130
	Improving Policies	0.519	0.519	0.519
	Strengthening NARS--Networks	0.259	0.259	0.259
		2.594	2.594	2.594
10. Land Management	Enhancement and Breeding (Beans)	0.042	0.042	0.042
	Enhancement and Breeding (Cassava)	0.042	0.042	0.042
	Enhancement and Breeding (Rice)	0.028	0.028	0.028
	Enhancement and Breeding (Livestock)	0.028	0.028	0.028
	Protecting the Environment	0.848	0.848	0.848
	Saving Biodiversity	0.141	0.141	0.141
	Improving Policies	0.283	0.283	0.283
		1.413	1.413	1.413
11. GCP Climate Change Helping Small Farmers Adapt	Production Systems (Bean)	0.120	0.120	0.120
	Production Systems (Cassava)	0.120	0.120	0.120
	Production Systems (Livestock)	0.240	0.240	0.240
	Protecting the Environment	0.335	0.335	0.335
	Strengthening NARS--Training	0.048	0.048	0.048
	Strengthening NARS--Information	0.048	0.048	0.048
	Strengthening NARS--Networks	0.048	0.048	0.048
		0.958	0.958	0.958

12. Small Scale Agroenterprises	Production Systems (Cassava)	0.185	0.185	0.185
	Protecting the Environment	0.185	0.185	0.185
	Strengthening NARS--Training	0.093	0.093	0.093
	Strengthening NARS--Information	0.093	0.093	0.093
	Strengthening NARS--Org & Mgt	0.278	0.278	0.278
	Strengthening NARS--Networks	0.093	0.093	0.093
		0.927	0.927	0.927
13. Information & Rural Development	Strengthening NARS--Training	0.485	0.485	0.485
	Strengthening NARS--Information	0.969	0.969	0.969
	Strengthening NARS--Org & Mgt	0.081	0.081	0.081
	Strengthening NARS--Networks	0.081	0.081	0.081
		1.616	1.616	1.616
14. Participatory Research	Enhancement and Breeding (Beans)	0.094	0.094	0.094
	Enhancement and Breeding (Cassava)	0.094	0.094	0.094
	Enhancement and Breeding (Livestock)	0.095	0.095	0.095
	Production Systems (Bean)	0.094	0.094	0.094
	Production Systems (Cassava)	0.094	0.094	0.094
	Production Systems (Livestock)	0.094	0.094	0.094
	Protecting the Environment	0.283	0.283	0.283
	Strengthening NARS--Training	0.057	0.057	0.057
	Strengthening NARS--Information	0.057	0.057	0.057
	Strengthening NARS--Org & Mgt	0.170	0.170	0.170
		1.133	1.133	1.133
15. Impact Assessment	Improving Policies	0.800	0.800	0.800
		0.800	0.800	0.800
16. Ecoregional Latin America	Production Systems (Bean)	0.017	0.017	0.017
	Production Systems (Cassava)	0.017	0.017	0.017
	Production Systems (Rice)	0.017	0.017	0.017
	Production Systems (Livestock)	0.020	0.020	0.020
	Protecting the Environment	0.070	0.070	0.070
	Saving Biodiversity	0.020	0.020	0.020
	Improving Policies	0.020	0.020	0.020
	Strengthening NARS--Training	0.010	0.010	0.010
	Strengthening NARS--Networks	0.010	0.010	0.010
		0.200	0.200	0.200
17. Soil, Water, and Nutrient Management (SWNM)	Production Systems (Bean)	0.018	0.018	0.018
	Production Systems (Cassava)	0.018	0.018	0.018
	Production Systems (Rice)	0.019	0.019	0.019
	Production Systems (Livestock)	0.127	0.127	0.127
	Protecting the Environment	0.303	0.303	0.303
	Improving Policies	0.061	0.061	0.061
	Strengthening NARS--Networks	0.061	0.061	0.061
		0.606	0.606	0.606
18. Systemwide Program on Participatory Research and Gender Analysis (PRGA)	Enhancement and Breeding (Beans)	0.099	0.099	0.099
	Enhancement and Breeding (Cassava)	0.099	0.099	0.099
	Enhancement and Breeding (Rice)	0.099	0.099	0.099
	Enhancement and Breeding (Livestock)	0.099	0.099	0.099
	Production Systems (Bean)	0.098	0.098	0.098
	Production Systems (Cassava)	0.098	0.098	0.098
	Production Systems (Rice)	0.101	0.101	0.101
	Production Systems (Livestock)	0.099	0.099	0.099
	Protecting the Environment	0.477	0.477	0.477
	Strengthening NARS--Training	0.127	0.127	0.127
	Strengthening NARS--Information	0.127	0.127	0.127
	Strengthening NARS--Org & Mgt	0.032	0.032	0.032
	Strengthening NARS--Networks	0.032	0.032	0.032
		1.590	1.590	1.590
19. Ecoregional Latin America	Pending	0.000	0.000	0.000
		0.000	0.000	0.000

Summary by Undertaking:

	2002 (proposal)	2003 (plan)	2004 (plan)
Increasing Productivity	13.455	13.455	13.455
Protecting the Environment	6.387	6.387	6.387
Saving Biodiversity	4.282	4.282	4.282
Improving Policies	1.799	1.799	1.799
Strengthening NARS	5.237	5.237	5.237
Total:	31.160	31.160	31.160

Summary by Output:

	2002 (proposal)	2003 (plan)	2004 (plan)
Germplasm Improvement	9.445	9.445	9.445
Germplasm Collection	4.282	4.282	4.282
Sustainable Production	10.397	10.397	10.397
Policy	1.799	1.799	1.799
Enhancing NARS	5.237	5.237	5.237
Total:	31.160	31.160	31.160

Table 5. CIAT - Investment, 2002-2004: Investments by Production Sector, Commodity and Region (in $ million).

PRODUCTION SECTORS & COMMODITIES	2002 (proposal)	2003 (plan)	2004 (plan)
1/ *Germplasm Enhancement & Breeding*			
Crops	7.867	7.867	7.867
Beans	3.732	3.732	3.732
Cassava	2.005	2.005	2.005
Rice	2.130	2.130	2.130
Fruits	0.114	0.114	0.114
Livestock	1.461	1.461	1.461
Trees			
Fish			
TOTAL	9.442	9.442	9.442
1/ *Production Systems Dev. & Management*			
Crops	2.746	2.746	2.746
Beans	0.894	0.894	0.894
Cassava	1.396	1.396	1.396
Rice	0.456	0.456	0.456
Fruits	0.114	0.114	0.114
Livestock	1.147	1.147	1.147
Trees			
Fish			
TOTAL	4.007	4.007	4.007
2/ *Total Research Agenda*			
Crops	24.589	24.589	24.589
Beans	10.718	10.718	10.718
Cassava	7.880	7.880	7.880
Rice	5.992	5.992	5.992
Fruits	0.528	0.528	0.528
Livestock	6.042	6.042	6.042
Trees			
Fish			
TOTAL	31.160	31.160	31.160

REGION	2002 (proposal)	2003 (plan)	2004 (plan)
Sub-Saharan Africa (SSA)	7.843	7.843	7.843
Asia	4.793	4.793	4.793
Latin American and the Caribbean (LAC)	18.035	18.035	18.035
West Asia and North Africa (WANA)	0.489	0.489	0.489
TOTAL	31.160	31.160	31.160

1/ Includes overheads, and must add up to the sum of the individual sectors/commodities from the project portfolio.

2/ Equals the sum of sectors/commmodities in Increasing Productivity, scaled up to total investments for the Research Agenda.

Loading Calculation

Total Research Agenda	2002	2003	2004
Beans	10.718	10.718	10.718
Cassava	7.880	7.880	7.880
Rice	5.992	5.992	5.992
Fruits	0.528	0.528	0.528
Livestock	6.042	6.042	6.042
	31.160	31.160	31.160

Table 6. CIAT - Expenditures, 2002-2004: Object of Expenditure, Capital Investment and Capital Fund Cash Reconciliation (in $ million).

OBJECT OF EXPENDITURE	2002 (proposal)	2003 (plan)	2004 (plan)
Personnel	15.200	15.400	15.400
Supplies and Services	12.610	12.410	12.410
Operational Travel	2.200	2.200	2.200
Depreciation	1.150	1.150	1.150
TOTAL	**31.160**	**31.160**	**31.160**
CAPITAL INVESTMENTS	**2002 (proposal)**	**2003 (plan)**	**2004 (plan)**
Physical Facilities			
Research			
Training			
Administration			
Housing			
Auxiliary Units			
sub-total	**0.000**	**0.000**	**0.000**
Infrastructure & Leasehold	**0.300**	**0.300**	**0.300**
Furnishing & Equipment			
Farming	0.100	0.100	0.100
Laboratory & Scientific	0.150	0.150	0.150
Office	0.020	0.020	0.020
Housing			
Auxiliary Units	0.100	0.100	0.100
Computers	0.350	0.350	0.350
Vehicles	0.420	0.420	0.420
Aircraft			
sub-total	**1.140**	**1.140**	**1.140**
TOTAL	**1.440**	**1.440**	**1.440**
CAPITAL FUND CASH RECONCILIATION	**2002 (proposal)**	**2003 (plan)**	**2004 (plan)**
Balance, January 1	0.517	0.427	0.337
plus: annual depreciation charge	1.150	1.150	1.150
plus / minus: disposal gains/(losses)	0.150	0.150	0.150
plus / minus: other	0.050	0.050	0.050
minus: asset acquisition costs	-1.440	-1.440	-1.440
equals: Balance, December 31	**0.427**	**0.337**	**0.247**

Table 9. CIAT- Staff Composition: Internationally and Nationally Recruited Staff, 2001-2004.

	2001 (estimated)		2002 (proposal)		2003 (plan)		2004 (plan)	
	Hired by:		Hired by:		Hired by:		Hired by:	
	center	other	center	other	center	other	center	other
Internationally-Recruited Staff (IRS)								
Research and Research Support	80	6	80	6	80	6	80	6
of which:								
Post-doctoral Fellows	6		6		6		6	
Associate Professionals	26	6	26	6	26	6	26	6
Training / Communications	3		3		3		3	
of which:								
Post-doctoral Fellows								
Associate Professionals								
Research Management	7		7		7		7	
of which:								
Post-doctoral Fellows								
Associate Professionals	1		1		1		1	
Total IRS	**90**	**6**	**90**	**6**	**90**	**6**	**90**	**6**
Support Staff	**600**		**600**		**600**		**600**	
TOTAL STAFF	**690**	**6**	**690**	**6**	**690**	**6**	**690**	**6**

DEFINITIONS

Internationally-Recruited Staff (IRS)

This category includes staff who carry out highly technical/senior functions, as defined by the center, and they may include personnel hired in the local or regional labor market. Included in this group, but shown separately, are post-doctoral fellows and associate professionals (who may have other titles in different centers), and who often are staff provided by donors as part of a project or other institutional arrangement. Costs for consultants engaged for specific tasks are not personnel expenses and the individuals are not staff; their costs should be calculated in the "supplies and services" category.

Support Staff

This category includes the numerical majority, in many cases, of personnel at a center. These are usually, but not necessarily always, individuals hired in the local labor market. They carry out functions which require less demanding skills than for the IRS category. The support staff category does not include seasonal field labor or other individuals engaged on a purely contract basis, for example when a center contracts with an employment agency to provide security, janitorial, and other services. Such costs should be calculated in the "supplies and services" category.

Table 10a. CIAT - Financial Position: Cash Requirement and Revenue Flow, 2001-2003 (in $'000).

MONTHLY CASH USES AND SOURCES

2001 Note: 1/	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Opening Cash Balance	5.957	8.883	5.350	4.996	3.713	3.725	3.551	2.895	2.541	2.637	2.748	4.704
Receipts												
Grants												
Unrestricted	4.300	0.089	1.200	0.100	1.246	0.230	0.040	0.000	0.000	0.275	2.320	2.200
Restricted	2.950	0.559	0.810	0.881	1.230	1.850	1.058	1.900	1.900	1.900	1.900	2.800
Earned Income/Others	0.066	0.319	0.066	0.066	0.066	1.066	0.066	0.066	0.066	0.066	0.366	0.066
Subtotal	**7.316**	**0.967**	**2.076**	**1.047**	**2.542**	**3.146**	**1.164**	**1.966**	**1.966**	**2.241**	**4.586**	**5.066**
Disbursements												
Operations	4.360	2.480	2.400	2.300	2.500	3.200	1.700	2.200	1.750	1.800	2.300	3.000
Capital Acquisition	0.030	0.030	0.030	0.030	0.030	0.120	0.120	0.120	0.120	0.330	0.330	0.330
Others	0.000	1.990	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.240
Subtotal	**4.390**	**4.500**	**2.430**	**2.330**	**2.530**	**3.320**	**1.820**	**2.320**	**1.870**	**2.130**	**2.630**	**3.570**
Net monthly movement	2.926	-3.533	-0.354	-1.283	0.012	-0.174	-0.656	-0.354	0.096	0.111	1.956	1.496
Ending Cash Balance	**8.883**	**5.350**	**4.996**	**3.713**	**3.725**	**3.551**	**2.895**	**2.541**	**2.637**	**2.748**	**4.704**	**6.200**

2002 Note: 2/	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Opening Cash Balance	6.200	8.040	6.280	5.720	4.330	4.170	2.820	2.610	2.160	2.410	2.690	4.110
Receipts												
Grants												
Unrestricted	3.000	0.100	1.200	0.100	1.200	0.200	0.040	0.000	0.000	0.260	2.000	2.200
Restricted	2.800	0.600	0.700	0.720	1.200	1.700	1.500	2.000	2.000	2.000	2.000	3.000
Earned Income/Others	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.080
Subtotal	**5.870**	**0.770**	**1.970**	**0.890**	**2.470**	**1.970**	**1.610**	**2.070**	**2.070**	**2.330**	**4.070**	**5.280**
Disbursements												
Operations	4.000	2.500	2.500	2.250	2.600	3.200	1.700	2.400	1.700	1.800	2.400	3.000
Capital Acquisition	0.030	0.030	0.030	0.030	0.030	0.120	0.120	0.120	0.120	0.250	0.250	0.290
Others	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	**4.030**	**2.530**	**2.530**	**2.280**	**2.630**	**3.320**	**1.820**	**2.520**	**1.820**	**2.050**	**2.650**	**3.290**
Net monthly movement	1.840	-1.760	-0.560	-1.390	-0.160	-1.350	-0.210	-0.450	0.250	0.280	1.420	1.990
Ending Cash Balance	**8.040**	**6.280**	**5.720**	**4.330**	**4.170**	**2.820**	**2.610**	**2.160**	**2.410**	**2.690**	**4.110**	**6.100**

2003 Note: 3/	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Opening Cash Balance	6.100	7.940	6.180	5.620	4.230	4.070	2.720	2.510	2.060	2.310	2.590	4.010
Receipts												
Grants												
Unrestricted	3.000	0.100	1.200	0.100	1.200	0.200	0.040	0.000	0.000	0.260	2.000	2.300
Restricted	2.800	0.600	0.700	0.720	1.200	1.700	1.500	2.000	2.000	2.000	2.000	3.000
Earned Income/Others	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.080
Subtotal	**5.870**	**0.770**	**1.970**	**0.890**	**2.470**	**1.970**	**1.610**	**2.070**	**2.070**	**2.330**	**4.070**	**5.380**
Disbursements												
Operations	4.000	2.500	2.500	2.250	2.600	3.200	1.700	2.400	1.700	1.800	2.400	3.000
Capital Acquisition	0.030	0.030	0.030	0.030	0.030	0.120	0.120	0.120	0.120	0.250	0.250	0.290
Others	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subtotal	**4.030**	**2.530**	**2.530**	**2.280**	**2.630**	**3.320**	**1.820**	**2.520**	**1.820**	**2.050**	**2.650**	**3.290**
Net monthly movement	1.840	-1.760	-0.560	-1.390	-0.160	-1.350	-0.210	-0.450	0.250	0.280	1.420	2.090
Ending Cash Balance	**7.940**	**6.180**	**5.620**	**4.230**	**4.070**	**2.720**	**2.510**	**2.060**	**2.310**	**2.590**	**4.010**	**6.100**

Table 10b. CIAT - Financial Position: Currency Structure of Expenditures, 2001-2003.

	2001 (actual) note 1/			2002 (estimated) note 2/			2003 (proposal) note 3/		
Currency	Amount	$ value	% share	Amount	$ value	% share	Amount	$ value	% share
US Dollar		15.096	51%		15.892	51%		16.203	52%
Colombian Peso	31,589	13.616	46%	35,055	14.022	45%	36,607	13.710	44%
Others note 4/		0.888	3%		1.246	4%		1.246	4%
TOTAL		29.600	100%		31.160	100%		31.160	100%

Notes:

1/ this part to be completed only in the Research Agenda submission (March).

2/ this part to be completed in both the Agenda & Financing Plan submissions.

3/ this part to be completed only in the Financing Plan submission (September).

4/ All other currencies the sum of which accounts for less than 5% of total expenditure.

Table 11. CIAT - Financial Position: Assets, Liabilities and Net Assets, 2000-2004 (in $'000).

Assets	2000 (actual)	2001 (estimate)	2002 (proposal	2003 (plan)	2004 (plan)
Current Assets					
Cash & Cash Equivalents	5,957	6,200	6,100	6,100	6,100
Accounts Receivable					
Donors	5,442	5,300	5,000	5,000	5,000
Employees	127	150	150	150	150
Other	1,255	1,000	1,000	1,000	1,000
Inventories	328	300	300	300	300
Prepaid Expenses	338	200	200	200	200
Investments	1,000				
Total *Current* Assets	**14,447**	**13,150**	**12,750**	**12,750**	**12,750**
Fixed Assets					
Property, Plant, & Equipment	23,008	23,805	24,605	25,405	26,205
Less: Accumulated Depreciation	-12,555	-13,255	-13,955	-14,655	-15,355
Total Fixed Assets - Net	**10,453**	**10,550**	**10,650**	**10,750**	**10,850**
Other assets	**122**	**100**	**100**	**100**	**100**
Total Assets	**25,022**	**23,800**	**23,500**	**23,600**	**23,700**
Liabilities and Net Assets					
Current Liabilities					
Bank Indebtedness	67	300	300	300	300
Accounts Payable					
Donors	3,983	3,638	3,499	3,499	3,449
Employees	385	500	500	500	500
Others	2,688	2,061	1,850	1,800	1,800
In-Trust Accounts	1,748	800	700	700	700
Accruals and Provisions [1/]	177	477	577	677	777
Total Current Liabilities	**9,048**	**7,776**	**7,426**	**7,476**	**7,526**
Long-Term Liabilities	2,666	2,716	2,766	2,816	2,866
Total Liabilities	**11,714**	**10,492**	**10,192**	**10,292**	**10,392**
Net Assets					
Appropriated	286	100	100	100	100
Unappropriated	13,022	13,208	13,208	13,208	13,208
Total Net Assets	**13,308**	**13,308**	**13,308**	**13,308**	**13,308**
Total Liabilities & Net Assets	**25,022**	**23,800**	**23,500**	**23,600**	**23,700**

Appendix III

List of Acronyms and Abbreviations

Acronyms

ADB	Asian Development Bank
AHI	African Highland Initiative
Bean/Cowpea CRSP	Bean/Cowpea Collaborative Research Support Program (*of the* University of Georgia, USA)
BoT	Board of Trustees (*of* CIAT)
CA	Département des Cultures Annuelles (*of* CIRAD)
CARDER	Corporación Autónoma Regional de Risaralda, Colombia
CARE	Cooperative for American Relief Everywhere
CATIE	Centro Agrónomico Tropical de Investigación y Enseñanza, Costa Rica
CBN	Cassava Biotechnology Network
CENIPALMA	Centro de Investigación en Palma de Aceite, Colombia
CIALs	Comités de Investigación Agrícola Local, Colombia
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
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement, France
CLODEST	Comité Local para el Desarrollo Sostenible de la Cuenca del Rio 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", Colombia
CONDESAN	Consorcio para el Desarrollo Sostenible de la Ecorregión Andina, Peru
CORPOICA	Corporación Colombiana de Investigación Agropecuaria
CSIRO	Commonwealth Scientific and Industrial Research Organisation, Australia
CURLA	Centro Universitario Regional del Litoral Atlántico, Honduras
DANIDA	Danish International Development Agency, Denmark
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
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, Brazil
EPMR	External Program and Management Review (*of* CIAT)
ETH	Eidgenössische Technische Hochschule, Switzerland
FAO	Food and Agriculture Organization of the United Nations
FCRI	Field Crop Research Institute, Thailand
FLAR	Fondo Latinoamericano y del Caribe para Arroz de Riego, *based at* CIAT
FONAIAP	Fondo Nacional de Investigaciones Agropecuarias, Venezuela
GRU	Genetic Resources Unit (*of* CIAT)
GWG	Gender Working Group (*of the* CGIAR Systemwide Programme on Participatory Research and Gender Analysis for...)
IBSRAM	International Board for *Soil* Research and Management, Thailand
ICA	Instituto Colombiano Agropecuario, Colombia
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

IDEAM	Instituto de Hidrología, Meteorología y Estudios Ambientales, Colombia
IDIAP	Instituto de Investigación Agropecuaria de Panamá
IDRC	International Development Research Centre, Canada
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 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
ILRI	International Livestock Research Institute, Kenya
INBIO	Instituto Nacional de Biodiversidad, Costa Rica
INIA	Instituto Nacional de Investigación Agraria, Peru (*now* INIAA)
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, Agricolas y Pecuarias, Mexico
INIVIT	Instituto de Investigaciones de Viandas Tropicales, Cuba
INTA	Instituto Nacional de Tecnología Agropecuaria, Argentina
IPGRI	International Plant Genetic Resources Institute, Italy
IPRA	Investigación Participativa en Agricultura/ *Participatory Research in Agriculture* (CIAT)
IRRI	International Rice Research Institute, the Philippines
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
LSU	Louisiana State University, USA
MT	Management Team (*of* CIAT)
NARO	National Agricultural Research Organization, Uganda
NRI	Natural Resources Institute, UK
NRMG	Natural Resource Management Group (*of the* CGIAR Systemwide Programme on Participatory Research and Gender Analysis for...)
OFI	Oxford Forestry Institute, UK
ORSTOM	L'Institut Français de Recherche Scientifique pour le Développement en Coopération, France (*now* L'Institut de Recherche pour le Développement)
PABRA	Pan-Africa Bean Research Alliance
PASOLAC	Programa de Agricultura Sostenible de Laderas en Centro América
PBG	Plant Breeding Group (*of the* CGIAR Systemwide Programme on Participatory Research and Gender Analysis for...)
PROCITROPICOS	Programa Cooperativo de Investigación y Transferencia de Tecnología para los Trópicos Suramericanos
PRODAR	Programa para el Desarrollo Agroindustrial Rural, Costa Rica
PROFRIJOL	Programa Cooperativo Regional de Frijol para Centro América, México y el Caribe
PROFRIZA	Proyecto Regional de Frijol para la Zona Andina
RIVM	Rijksinstitut voor Volksgezondheid en Milienhygiene (National Institute of Public Health and Environmental Protection), The Netherlands
SABRN	South Africa Bean Research Network
SDC	Swiss Agency for Development and Cooperation
SINCHI	Instituto Amazónico de Investigaciones Científicas, Colombia

SINGER	The CGIAR System-wide Information Network for Genetic Resources
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
SWNM	The CGIAR Systemwide Program on Soil, Water & Nutrient Management
TAC	Technical Advisory Committee (*of the* CGIAR)
TCA	Tratado de Cooperación Amazónica
TSBF	Tropical Soil Biology and Fertility Programme, Kenya
UNEP	United Nations Environment Programme
UNIVALLE	Universidad del Valle, Colombia
USDA	United States Department of Agriculture
WARDA	West Africa Rice Development Association, Cote d'Ivoire
WRI	World Resources Institute, USA
WWW	World Wide Web

Abbreviations

ACMV	African cassava mosaic virus
AES	Agroecosystem
Al	Aluminum
ARIs	Advanced research institutes
AROs	Advanced research organizations
C	Carbon
CBB	Common bacterial blight of bean; Cassava bacterial blight
CD-ROM	Compact disk—read-only memory
CLOs	Comités locales
DCs	Developed countries
DS	Decision support
ESTs	Expressed sequence tags (biotechnology)
FM	Forest margins
FPR	Farmer participatory research
FTE	Full-time equivalent
GA	Gender analysis
GIS	Geographic information systems
GOs	Governmental organizations
HS	Hillsides
IARCs	International agricultural research centers (the CGIAR system)
INIAs	Instituciones nacionales de investigación agropecuaria
IPM	Integrated pest management
IPR	Intellectual property rights
LA	Latin America (n)
LAC	Latin America and the Caribbean
LDCs	Less-developed countries
LoRSDIs	Local rural sustainable development initiatives
M&E	Monitoring and evaluation
MTA	Material transfer agreement (used in germplasm exchange)
MTP	Medium-Term Plan (CIAT)

N	Nitrogen
NARES	National agricultural research and extension systems
NARIs	National agricultural research institutes
NARS	National agricultural research systems
NGOs	Nongovernmental organizations
NRM	Natural resource management
P	Phosphorus
PB	Plant breeding
PPB	Participatory plant breeding
PR	Participatory research
R&D	Research and development
RHBV	Rice "hoja blanca" virus
SP	Systemwide program (*of the* CGIAR)
SROs	Specialized research organizations
SS	Senior staff (*of* CIAT)
TLA	Tropical Latin America