CIAT 1997 Program Plans and Funding Requirements

Including 1995 Outcome and 1996 Program and Working Budget

CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

Contents

I. Introduction

In a world of accelerating change, CIAT remains committed to its mission of contributing to the alleviation of hunger and poverty in developing countries by applying science to the generation of technology that will lead to lasting increases in agricultural output, while preserving the natural resource base. To take advantage of new opportunities while coping with ever more difficult resource constraints, CIAT has implemented important changes in recent years:

- The Center has taken up new challenges, including the improvement of natural resource management, a renewed ecoregional role in Latin America, and an increased concern with conserving agrobiodiversity.

- In its ongoing research activities, CIAT has fully adopted new scientific methods, including biotechnology, geographic information systems, and participatory research techniques.

- New organizational patterns have been introduced, including the project management system, participation in CGIAR systemwide programs, stronger research partnerships with NARS and with advanced research organizations, and the CGIAR project matrix.

- Financial conditions have changed, as private industry has assumed some responsibility for rice research in Latin America, Colombia has joined the CGIAR as a contributing member, and many important long-time members have had to significantly reduce their investments in the CGIAR system.

Recognizing that CIAT must continue to adjust to changing circumstances, the Board of Trustees, in its December 1995 meeting, requested that Center prepare for its consideration options for structural adjustment. The Program Committee of the Board requested that the process follow these guidelines:

- Reduce expenditures to the level of expected income.
- Maintain the Center's commitment to its current mandates.
- Preserve the integrity of CIAT's core scientific competencies.
- Enhance integration of efforts within the Center.
- Expand strategic alliances with partners.

Moreover, the Board expected that a positive and forward-looking vision for CIAT should permeate the structural adjustment options. They must enable the Center to continue contributing substantially to the agenda of the CGIAR. The development objectives and research themes of utmost concern to CGIAR stakeholders provide key signposts for orienting CIAT's future strategy.

TAC has embarked on a prioritization exercise, whose outcomes will provide a structure for preparation of the centers' 1998-2000 midterm plans. TAC's analysis is based on two

main criteria: 1) ***poverty alleviation*** and 2) ***environmental protection***. At ICW95 the members of the CGIAR clearly endorsed these criteria. Moreover, several members, among them Germany, expressed particular concern with ***rural poverty*** and especially poverty in ***fragile lands***. Numerous members (including Canada, Denmark, and Norway) emphasized the need for a ***user orientation***, including a ***gender perspective***, that can be realized through ***participatory research approaches***. Market opportunities are clearly seen as the engine for improving the incomes of the rural poor, and several members (e.g., France, IFAD, and USAID) stressed the need for research on postharvest technology and ***rural agroenterprises***.

CIAT can make vital, high-profile contributions to this agenda through a well-chosen portfolio of projects. The Center is especially well placed to deliver significant outputs that contribute to ***environmental protection*** in the following areas:

- ***Crop biodiversity:*** By conserving and utilizing neotropical genetic resources for the world.

- ***Forest margins:*** By restraining the expansion of agricultural frontiers to preserve forest resources.

- ***Regenerative systems for tropical soils:*** By improving organic matter management to regenerate degraded soils.

- ***Integrated pest and disease management:*** By developing and promoting management systems that minimize pesticide use.

- ***Policy information systems:*** By providing databases and methods that support decision making aimed at improving natural resource management.

Although ***poverty*** is concentrated mainly in Africa and Asia, sizable segments of the population in Latin America and the Caribbean continue to live in absolute poverty. CIAT can make a major contribution to poverty alleviation through research on the following topics:

- ***Crops for fragile areas:*** Beans, cassava, and forages are important for the poor in marginal areas of Africa and Asia as well as Latin America.

- ***Participatory methods:*** Approaches developed at CIAT, if applied globally, would benefit the poor by introducing a stronger user perspective in research.

- ***Integrating production and marketing:*** Improved market integration is the key to raising incomes and reducing poverty.

- ***Hillsides and forest margins:*** Alleviating poverty is the key to improved resource management in these agroecosystems.

- ***Environmental protection:*** Most CIAT work on this theme is closely linked to poverty alleviation.

In summary, there are significant opportunities for CIAT to deliver outputs that contribute to poverty alleviation and environmental protection. These must be clearly reflected in the Center's plan for structural adjustment. Moreover, to be successful, this plan must:

- Set CIAT's sights on meaningful and attainable goals that are congruent with the concerns of stakeholders.

- Enable the Center to organize itself for effective production of the desired outputs.

- Assign and utilize scarce public resources wisely and prudently.

- Make CIAT more outward looking—alert to new opportunities to satisfy the needs and concerns of stakeholders and open to strategic partnerships with institutions that share our goals.

This presentation of CIAT's 1997 Program Plan and Funding Requirements incorporates the principal elements of the structural adjustment plan, which were presented to and approved by the Center's Board of Trustees in February 1996.

Section II of the document reviews CIAT's research mandates and presents recent highlights, including developments related to the Center's involvement in systemwide initiatives and programs. Section III provides details on finances and budgeting. Section IV describes CIAT's portfolio of projects, which are designed to meet mandate objectives. The services needed to support these research projects are considered in Section V. Financial tables are given in an annex.

II. CIAT's Research Mandates and Highlights

CIAT's mandate areas were chosen with great care according to several criteria:

- They must allow the Center to make a balanced contribution to productivity, poverty alleviation, and sustainable management of natural resources.
- They must draw on CIAT's comparative advantages, especially with respect to the mandates of other centers in the CGIAR system.
- They must show a particular concern for the development of Latin America and the Caribbean.

In contrast to some other IARCs, which from their inception were closely identified with specific commodities, CIAT has germplasm research mandates that resulted from explicit choices about the commodities to be improved. As discussed in detail below, CIAT's current commodity portfolio of beans, cassava, rice, and tropical forages remains highly relevant to the needs, not only of Latin America but Africa and Asia as well.

CIAT's mandate to improve resource management in the forest margins, hillsides, and savanna agroecosystems of Latin America emerged in the late 1980s, as a result of intensive analysis of natural resource problems and opportunities in the region.

The CGIAR system has recently asked CIAT to serve as an ecoregional convening center for Latin America. This is not an altogether new mandate, since CIAT has from the start developed an especially close relationship with Latin America and the Caribbean. Initially, the Center defined its priorities and mandates solely in the context of this region. Only later did CIAT accept global responsibilities for the crops that it had originally selected for their importance in Latin America and the Caribbean. Thus, the ecoregional function of CIAT simply reaffirms and reformulates its historic commitment to satisfying the needs of the region.

Over the past 2 years, CIAT has begun participating in various systemwide programs. In 1995 the Center was confirmed as the convener of the Systemwide Soil, Water, and Nutrient Management Initiative. In 1996, TAC has encouraged us to proceed with the development of a systemwide initiative for participatory research and gender analysis. CIAT also plays an active role in the Systemwide Genetic Resources Program, the Systemwide Livestock Program, the Systemwide Integrated Pest Management Initiative, Alternatives to Slash and Burn, and African Highlands Initiative.

Bean Program

Goal: To make a lasting contribution to the food security and incomes of the poor by improving bean productivity through technology developed in collaboration with national institutions.

Importance: Common bean (*Phaseolus vulgaris*) is the world's most important food legume. The global value of production exceeds US$6 billion dollars, twice that of the next leading food legume. Of this production 80% occurs in developing countries. The major bean-producing regions in the developing world are Brazil, the highlands of eastern and southern Africa, Mexico, and Central America. There is also significant bean production in temperate South America, the Andean region, China (snap beans), North America, and Eastern Europe.

Beans are a nearly perfect food. They are commonly referred to as "the poor man's meat," because they are high in protein and relatively inexpensive. But the crop is also an important source of calories, iron, folic acid, dietary fiber, and complex carbohydrates, which are especially important to young children and child-bearing women. In eastern and southern Africa, beans are the second most important source of protein after maize, and the third most important source of calories. In Latin America, where diets are more diversified, beans are equal to beef in importance as a source of protein and are ranked sixth as a contributor of calories, exceeding other important staples, such as cassava, potatoes, and beef.

Strategy: To work effectively on a global scale, the Program pioneered a strategy for grouping countries into regional research networks to achieve more efficient development and transfer of new technologies across large areas. The first network was begun in 1978 in Central America (PROFRIJOL). Since then four other networks have been established: the Africa Great Lakes Regional Network (RESAPAC) in 1984, Eastern Africa Network (EABRN) in 1985, Southern African Network (SADC) in 1986, and Andean Network (PROFRIZA) in 1987.

The Bean Program's main contribution to these networks is to solve recalcitrant and complex production problems, primarily through germplasm improvement and associated research. For this purpose the Program makes full use of the world *Phaseolus* germplasm collection housed at CIAT. To complement genetic solutions, the Program also does research on crop, pest, and natural resource management. The outputs of this work are as follows:

- *Phaseolus* genetic resources maintained, characterized, and deployed (Projects #13, 14, 15)[1]
- Enhanced resistance to diseases and pests, greater tolerance to abiotic stresses, and increased yield potential (Project #1)
- Improved gene pools and regional networks for applied research in Latin America and the Caribbean (Projects #5, 18)
- Improved gene pools and cropping systems and regional networks for applied research in sub-Saharan Africa (Projects #6, 18)

1. CIAT's portfolio of 22 projects is described in Section IV.

Highlights: Recent work in Tanzania has demonstrated the value of the *Phaseolus* core collection, which CIAT bean researchers formed several years ago in cooperation with specialists in biotechnology and geographic information systems (GIS).

Part of the collection was evaluated for its reaction to bean stem maggot, the most devastating pest of the crop in Africa. These materials showed surprisingly good levels of resistance, more than tripling the number of sources available. Studies on the mechanisms of this resistance suggest that more than one type operates in common bean, making it possible to obtain quite high levels of resistance through genetic recombination and selection.

This work takes place against a background of research consolidation in the region. In 1995 two networks were merged to form the Eastern and Central Africa Bean Research Network, which is part of the Pan-Africa Bean Research Alliance.

At Center headquarters we continue to evaluate the core collections at the molecular level, using RAPD and AFLP analysis. This work is yielding new insights into the patterns of genetic diversity in *Phaseolus*, which will help guide the search for useful genes in Africa and Latin America.

Cassava Program

Goal: To enhance the contribution of cassava to the well-being of farmers, processors, and consumers.

Importance: Global cassava production in 1995 was estimated at about 155 million tons. During the last decade, production increased at an average rate of 1.8% per annum. Production has grown fastest in Africa (2.7%), followed by Asia (0.8%). In Latin America production has essentially stagnated, although in the last 3 years it has shown signs of recuperation after a period of severe drought. On all continents cassava area is increasing at a faster rate than yield. This trend has resulted mainly from the movement of cassava production from relatively fertile environments, where it is being replaced by higher valued crops, to regions with poorer soils and/or lower rainfall.

Cassava cultivation and processing provide household food security, income, and employment for over 500 million people in Africa, Asia, and the Americas. The crop is tolerant to low soil fertility and drought. Roots can be stored for long periods in the ground and have multiple end uses. These attributes have given the crop an important role in alleviating hunger and in providing opportunities for economic development in less favored rural areas.

Strategy: The Program generates knowledge, research methods, and technology components that will lead to sustainable improvement in the level, stability, and quality of

cassava production and to diversification in the end uses of the crop. The relevance of the Program's work depends on the establishment of strong links with partner institutions in developed and developing countries.

The Program has adopted an interdisciplinary, commodity system philosophy that integrates research on germplasm improvement with research on crop management and process, product, and market development. The products of this research are as follows:

- Conserved and characterized *Manihot* genetic resources (Projects #13, 14, 15)
- Improved cassava gene pools, with adaptation to major biotic and abiotic constraints and appropriate quality characteristics (Project #2)
- Crop management practices for economically and environmentally sustainable cassava production (Project #7)
- Cassava agroindustrial processes that strengthen links between small-scale farmers and markets (Project #12)
- A stronger capacity for cassava research and development at the national, regional, and global levels through needs assessment methodologies for priority setting, information services, and training (Projects #17, 18)

Highlights: In cassava improvement and pest management, CIAT scientists have registered important complementary achievements in upstream and downstream research.

We nearly completed the preliminary version of a genetic molecular map of cassava and will publish it 1996. CIAT will be the first international center to have developed such a map in its entirety. We expect that it will greatly increase the speed and precision of cassava improvement.

Other developments at the opposite end of the research spectrum have a similar effect. Major cassava programs in Asia and Latin America are now routinely applying the Center's methods for farmer participation in the evaluation and selection of cassava clones. This approach increases the efficiency of crop improvement by eliminating at an early stage materials that do not satisfy farmers' requirements.

Likewise, the farmer research teams formed during 1995 in Northeast Brazil will improve the effectiveness of work on integrated management of cassava pests. Important developments in this research included the identification of whitefly resistant clones and the release of predators of cassava green mite.

Rice Program

Goal: To improve the nutritional and economic well-being of rice growers and low-income consumers in Latin America and the Caribbean through sustainable increases in rice production and productivity.

Importance: Rice is the most important grain crop for human consumption in most of the tropics of Latin America and the Caribbean (LAC). It supplies more calories in people's diet than wheat, maize, cassava, or potatoes, and for the poorest 20% of the region's population, it even supplies more protein than any other food source, including beef, milk, and beans.

By steadily reducing the real price of rice, research benefits mainly that half of the population in LAC that live below the poverty line (as defined by FAO). Food purchases account for over 50% of the total expenditures of the poor, and rice accounts for about 15% of their total food purchases. Rice is preferred by the poor, because it is cheap, nutritious, appealing, easy to prepare, and easy to store and transport.

Strategy: The Rice Program takes advantage of two key factors that give CIAT a comparative advantage in rice research and increase our prospects for success. One, since rice is simple and inexpensive to multiply, the delivery of seed-borne technology is relatively straightforward. And second, since the commercial rice sector in LAC is well organized, new technology is adopted fairly rapidly.

This second factor has made possible the creation of the Latin American Fund for Irrigated Rice (FLAR), an innovative semiprivate mechanism created in 1995 to finance irrigated rice research in Latin America.

The future of rice research holds exciting challenges and opportunities. CIAT's contributions will take the form of the following outputs:

- Improved rice gene pools (Project #3)
- Integrated crop management practices (Project #8)
- Strengthened private and public sector linkages to rice research (Project #18)

An important challenge for the Program is to develop upland rice gene pools with tolerance to low phosphorus and high aluminum in savanna soils, work that is closely integrated with the Tropical Lowlands Program.

Highlights: 1995 brought new evidence of the value of rice germplasm provided through CIAT, and of the Center's strong capacity to deliver innovative techniques and tackle major threats to production.

Eight new varieties developed from CIAT-derived materials and distributed by INGER-LAC nurseries were released in Latin America this year. As part of a strategy to raise yield ceilings, CIAT has started adapting the new plant type developed at IRRI to Latin American conditions.

INGER, FLAR, and CIAT organized a breeders workshop in August. INGER also organized a workshop in Brazil on recurrent selection of rice, a method that CIAT is

actively applying and promoting with support from CIRAD. In addition, we completed a 2-year project, funded by the Rockefeller Foundation, for transferring an anther culture method of rice improvement to national programs. Several are now using this tool routinely.

Studies on rice blast, the crop's most devastating disease worldwide, have identified valuable insights as well as new sources of resistance, which are now being deployed in several of the region's commercial rice varieties.

In work on another major stress, rice hoja blanca virus, rice plants were successfully transformed with coat protein gene and with the antisense of the major nonstructural gene of the virus. These plants are now being tested for genetic stability and possible use as resistance sources.

Tropical Forages Program

Goal: To increase the efficiency of livestock production and contribute to sustainable land use in production systems of the subhumid and humid tropics through collaborative research aimed at identifying, improving, and deploying multipurpose grasses and legumes.

Importance: In tropical America 79% of the agricultural land (or 420 million hectares) is used for grazing. Beef, dairy, or dual-purpose cattle account for 81% of the total cattle and for 70% of the total beef and milk production in Latin America. Low quality and seasonal fluctuation in forage supply are the main barriers to more efficient production. A large proportion of the grazing land (245 million hectares) lies within the CIAT mandate agroecosystems. Much of this area is considered to be degraded in terms of reduced livestock productivity, invasion by undesirable species, and loss of soil productivity. This degradation is most severe in marginal areas, such as the hillsides and forest margins. In the savannas the area of cultivated land has increased rapidly, accompanied by soil erosion, soil physical deterioration, and nutrient loss.

It has been demonstrated that improved, well-managed grass, grass-legume, and pasture-crop systems can contribute to overcoming the limitations in feed supply and to reducing land degradation. Ex-ante analysis suggests that the expected present net value of social benefits from research on forages in grass-based, legume-based, and pasture-crop systems could reach US$4 billion over 25 years, with an internal rate of return of 55%. In addition, there is strong demand for effective leguminous covers and green manures to reduce soil loss and control weeds in tree plantations and potential demand for forages to improve fallow land.

In Asia and Africa, there is a need for legumes and grasses that can add value to intensive production systems (e.g., to supplement crop residues and improve soil fertility in plantations).

ICRISAT, organizations in developed countries, and NARS involved in the RIEPT and SEAFRAD networks to improve problem definition, share resources, and ensure transfer of technology. The outputs of CIAT's research will be as follows:

- Identification and maintenance of legume and grass ecotypes for multiple uses (Projects #13, 14, 15, 16)
- Gene pools of commercial grasses and legumes with high feed value and tolerance to abiotic and biotic stresses (Project #4)
- Forage components developed and deployed in production systems (Project #9)
- Research and training networks in Latin America and Southeast Asia (Projects #9, 18)

Highlights: Forage researchers made good progress during 1995 in widening the range of genetic diversity available, in introducing promising species into farmers' systems, and in overcoming constraints of important species. We also increased collaboration with other IARCs and NARS.

We undertook major collections of *Arachis* and of the legume shrub *Cratylia argentea* with national cooperators in Brazil. In addition, we identified new accessions of *A. pintoi* that will widen its range of adaptation and of *Cajanus cajan* for hillsides.

Our Forages for Smallholders project in Southeast Asia is establishing strong links with national programs. In cooperation with them, a CIAT agronomist is pursuing an innovative approach to farmer participation in research on promising forages for complex Asian production systems. Similarly, for Latin America we embarked on a major on-farm program this year for introducing *A. pintoi* and other legumes in forest margins.

In research on *Brachiaria* grass, we confirmed that AFLP as well as RAPD markers are linked to apomixis in a hybrid population. This is an important step toward our goal of increasing the efficiency of selection in *Brachiaria* for desirable adaptive traits as well as apomictic seed production.

A new project funded by the Japanese government will examine the role of endophytic fungi in tropical grasses. Through this research we hope to identify novel approaches for crop protection.

Hillsides Program

Goal: To improve the welfare of hillsides farming communities by developing sustainable and commercially viable production systems.

Importance: Hillside agroecosystems in Latin America provide a livelihood for a large proportion of the region's rural poor. In an effort to meet basic food requirements,

smallholders are compelled to use practices that erode the soil and destroy native biodiversity.

To find solutions to this problem requires an understanding of the biophysical determinants of resource degradation and rehabilitation. But in order for solutions to be adopted, one must also understand the socioeconomic context. Hillside communities possess unique cultural traditions and value systems, including indigenous approaches to group action. But, being marginalized by mainstream society, these people lack established channels for negotiating with groups outside the community that are affected by their resource management practices.

Strategy: The Hillsides Program is pioneering methods for involving farmers and communities in setting research priorities and objectives and in forming consortia for community action to improve resource management. This research is organized around four outputs:

- Technologies and cultural practices for soil regeneration (Project #11)
- Prototype systems for integrated management of production and conservation (Project #10)
- Decision-support systems for watershed users (Projects #18, 20)
- Community organization and participatory research methods for natural resource management (Projects #18, 19)

Given the extreme diversity of the biophysical and social environment of the hillsides, it would be unrealistic to design broadly applicable technologies for improving productivity and resource management. Instead, the Program aims to provide an approach and a set of methodological tools that better enable client organizations to extrapolate, target, and promote conservation practices, production systems, and new land use strategies through decentralized, location-specific research.

To this end the Program identifies principles and mechanisms of soil degradation and regeneration that can be used to design locally adapted practices. These practices need to be integrated into production systems that also protect the environment. The development and application of methods for farmer participation in research improves the design of the these systems.

In hillside environments natural resources have multiple uses, and there are many impoverished users of any given resource. Moreover, off-site or downstream users of these resources have a vested interest in how they are managed. Consequently, to achieve the adoption of improved resource management practices, involving competing interests, requires conflict management. For this purpose the Hillsides Program provides better information from research, through decision-support systems, that help multiple stakeholders reach a consensus on how to develop and conserve hillside environments.

At present the program is focusing its research on 100,000-ha watershed in Cauca department, southwest Colombia, and in five subwatersheds (5,000-10,000 ha) in Honduras and Nicaragua.

The Hillsides Program works closely with a wide range of partners, including advanced research institutions in donor countries, other IARCs, regional institutions, and several government and nongovernment organizations.

Highlights: In research on hillsides, CIAT staff made particularly important advances in two areas—farmer participation and geographical characterization. This work is critical for conducting effective strategic research for solving problems in an agroecosystem characterized by tremendous human and agroclimatic diversity.

Resource degradation has grave consequences not just for individual farmers but for whole groups in society. The search for solutions therefore requires broad participation in rural communities. To promote effective methods for organizing farmer participation in research on a large scale, we made a heavy investment this year in training for the tropical forages project in Southeast Asia and for the cassava pest management project in Northeast Brazil. Under a project funded by the Kellogg Foundation, we also entered into agreements for training in Bolivia and Ecuador.

The development of GIS databases on land use in hillside environments is greatly complicated by the prevalence of sloping land and small plots, which distort remote imagery. Working closely with GIS specialists at CIAT, we made good progress this year in overcoming those difficulties. The Center is now well placed to develop user-friendly, interactive GIS databases that will help our own staff and others analyze resource management issues and plan research.

Tropical Lowlands Program

Goal: To develop and test a diverse set of sustainable land use forms for the acid soil savannas and forest margins of tropical America.

Importance: The neotropical savannas constitute the last significant agricultural frontier in the world. But they are also a fragile and precious natural resource, rich in flora and fauna and located in the basin of major American rivers. This environment extends over 250 million hectares, including the Cerrados of Brazil, the Llanos of Colombia and Venezuela, and large areas of Bolivia.

Over the last 40 years, significant areas of the neotropical savannas have been settled, and inappropriate technology for agricultural production has been widely applied. As a result, erosion, soil chemical and physical degradation, and the buildup of pests in monocropped areas are common problems. The impact of land use on flora and fauna has not been thoroughly assessed but does constitute a major problem.

Agricultural frontiers have also expanded rapidly in the forest margins, beginning in the 1960s. Between 1970 and 1985, the rate of deforestation in the Brazilian Amazon was estimated at 1.5-2.0 million hectares per year. Even so, there are still considerable opportunities for influencing future land use patterns, since only 6% of that area has been cleared.

Strategy: The Program's research strategy is reflected in the three main outputs of its work:

- A demand-driven orientation to technological and policy interventions in the Latin American savanna and forest margins (Project #21)

- Technologies that permit sustainable production in the acid-soil savannas and forest margins of tropical America and that reduce environmental degradation by maintaining or enhancing the natural resource base (Project #10)

- A better understanding of the biophysical processes underlying improved agricultural productivity, soil conservation, and the regulatory and ameliorative functions of soils (Project #11)

Highlights: CIAT research on the processes underlying soil degradation and on the development of systems that regenerate the soil continued to build momentum.

Long-term experiments begun in 1989 have yielded valuable information on the impoverishment of soils under continuous monocropping and poorly managed sown pastures. Our work has also produced new evidence that agropastoral systems (which combine tropical grass and legume forages with rice and other crops) can reverse the decline, improving the chemical, physical, and biological condition of the soil.

Research partners from national and regional research programs, universities, and farmer cooperatives showed keen interest in agropastoral systems at a workshop held during 1995 in Bolivia. A key purpose of the meeting was to standardize methodologies for research on these systems to facilitate data exchange. The event, partially financed by IDB, also discussed the agenda for the savannas portion of CIAT's Ecoregional Program. The external consultant who conducted the review strongly endorsed our research approach.

Tropical America Ecoregional Program

Goal: To enhance the effectiveness of research in agriculture and natural resource management in tropical America by strengthening the region's capacity to define and understand productivity problems in agriculture and to extrapolate results across agroecosystems.

Importance: The agroecosystems of tropical America are extremely diverse, yet the resources for national research in these environments are increasingly scarce. It is thus beyond the individual capacity of all but the largest national programs to develop solutions to the numerous and varied problems that degrade the resource base and depress agricultural productivity. Given the diversity of the region's agroecosystems, research cooperation among countries is vital, focusing particularly on their capacity to link research and technology transfer in similar but often distant agroecosystems.

An accurate knowledge of the extent of different agroecosystems and their associated constraints makes it possible to concentrate limited research resources where they can make the greatest difference. Thus, there is a need for a regional effort to identify common problems and widely applicable solutions as well as to develop technology and policy options to address priority problems through joint action, leading to equitable sharing of benefits.

Ecoregional research addresses environmental-agricultural linkages through a landscape-based regional perspective. It involves improving the productivity of agricultural systems, while ensuring their sustainability through judicious management of resource stocks and flows (e.g., hydrological cycles, nutrient fluxes, biomass accumulation, and agrobiodiversity).

Difficulties in the geographical delineation of problems limit our ability to quantify the extent of constraints, select representative sites, and extrapolate results widely from a limited number of sites. Moreover, understanding the relation between land use systems and their environments is based principally on expert opinion rather than statistical analysis of data.

Strategy: The central outputs of this project are designed to enhance the region's capacity to prioritize, plan, target, and extrapolate research on natural resource management in tropical America:

- Enhanced capacity for cross-country prioritization, targeting, and extrapolation (Project #17)
- Improved methods to target and extrapolate research at the agroecosystem level (Projects #20, 21, 22)
- Methods for identifying problems in priority watersheds (Projects #20, 22)
- Strengthened national capacity to use georeferenced models and data (Projects #18, 22)

Highlights: Early in 1995 meetings were held with various consortia to consult with NARS about research issues in particular agroecosystems. At about midyear TAC endorsed CIAT's proposal for an ecoregional program. After ICW95 the Swiss government and IDB pledged support to the program, and it was presented at a joint meeting of PROCIANDINO and PROCITROPICOS.

A UNEP-supported project on environmental and sustainability indicators, which got well under way in 1995, is already contributing to several of the aims of the ecoregional framework. The project developed a framework for defining and using indicators at the regional, national, and local levels and is now planning with UNEP a regional conference to consult with potential users of these tools.

Participation in Systemwide Programs

Soil, Water, and Nutrient Management (SWNM) Program: In February 1995, CIAT and IBSRAM prepared a program proposal for TAC's meeting in Lima. The two centers organized a meeting in June at Feldafing, Germany, a report of which was delivered to the TAC task force on natural resource management. Between these events, CIAT prepared an inventory of research on soil and nutrient management in the CG and associated centers.

By mid-1995, TAC had endorsed a revised version of the CIAT/IBSRAM proposal and recommended the allocation of US$900,000 to initiate the SWNM program. The CG confirmed that an additional $350,000 would be available for 1995. At a meeting of the convening centers during ICW95, the governments of Germany, The Netherlands, and Norway pledged further support for the program in 1996.

In December 1995 a meeting was held for participants in Managing Acid Soils (MAS), one of six research consortia that make up the SWNM initiative.

Early in 1996 participants in the SWNM program convened at Rome to prepare a proposal for consideration by TAC69. The Committee responded favorably, approving an allocation of $1.0 million for program coordination and for suggested changes in research directions, particularly with respect to work on optimizing soil water use. A revised proposal is being prepared that is within this funding level and that responds to TAC's comments.

Participatory Research and Gender Analysis Initiative: In March 1996, TAC encouraged CIAT to proceed with the development of this initiative. It also recommended, tentatively, that $900,000 be set aside for the work in 1997, on the condition that a proposal for a research program is approved. The goal of the program would be to improve the ability of the CGIAR System to alleviate poverty, improve food security, and protect the environment, with greater equity, by applying upstream participatory approaches in research.

Over the last decade or more, the IARCs have done substantial work to introduce a user perspective into *downstream* adaptive research. This program would build upon that work but concentrate more on user participation in the *upstream* stages of certain types of research. A new role for farmers—one in which they help set priorities, define criteria for success, and determine when an innovation is "ready" for release—could dramatically increase the impact and reduce the cost of applied research.

To determine the potential of upstream participatory research requires considerable effort in methodology development. The outputs of this work will be participatory techniques and tools for gender analysis that are useful inside and outside the CGIAR. By pooling resources in a systemwide effort, institutions could greatly accelerate the development of new tools that make farmers genuine partners in research.

Genetic Resources Program: As a result of a planning meeting held in Mexico for the SINGER project, CIAT received funds to develop in 1996 a computerized system that will improve access to data on genetic resources stored at the Center.

Along with other centers that safeguard genetic resources, CIAT underwent an external review of its gene bank during 1995. In a report on the status of the bank's activities, the review panel identified a number of pressing needs (e.g., the introduction of *Phaseolus* and tropical forage accessions into long-term storage and safety duplication of cassava and forage collections). The panel also commended Center staff for their application of molecular marker and GIS techniques to research on core collections and for their progress in cassava cryopreservation.

CIAT submitted three proposals at a meeting held in Lima by the Intercenter Working Group on Genetic Resources for possible funding by the systemwide program. Among the total of 32 proposals submitted by all centers, two from CIAT received very high ratings. These focus on cassava cryopreservation and application of molecular markers and GIS to studies of *Manihot* and *Phaseolus* genetic resources.

Livestock Program: The Center is well-placed to contribute importantly to this program. Among projects submitted for funding under the systemwide initiative, a 3-year CIAT project was ranked first. Referred to as Tropileche, the project will investigate legume-based forages for dual-purpose cattle production systems, with research activities in Colombia, Costa Rica, and Peru.

Alternatives to Slash and Burn: In this program CIAT has made significant contributions, complementing the research supported by UNDP/GEF. Staff at Center headquarters have done considerable GIS analysis of land use patterns at study sites in the southwest Brazilian Amazon and have coordinated and implemented field work aimed at further characterizing land use by settlers and at assessing some of the ecological and economic consequences of current land use systems.

The success of these activities has made CIAT a recognized leader on methodological issues in the program. Center staff have published a number of articles on the work in peer-reviewed journals. Results from the analysis of deforestation at the sites in Brazil indicate that policy is a more decisive factor than technology in determining the extent of land clearing.

Africa Highlands Initiative: Several CIAT bean researchers based in eastern Africa played active roles in the initiative during 1995, participating in technical advisory panels on plant protection for intensive production systems, on maintenance and improvement of soil productivity, and on socioeconomic analysis. In addition, the Center appointed a research fellow based in western Kenya to investigate soil fertility practices for managing bean stem maggot and bean root rots. CIAT staff took part in a series of consultations and planning workshops and then initiated research activities during the latter part of the year.

Program on Integrated Pest Management: TAC has approved the eight research projects selected by program participants in their first meeting, held at the Hague in February 1995. CIAT has been designated the lead center for two of those projects: 1) integrated management of whiteflies and 2) participatory methods for implementing IPM. Center staff will also take part in three other projects: 1) integrated management of insect pests in grain legumes, 2) rice weed management, and 3) characterization of agrobiodiversity for sustainable production systems. TAC approved funds to form task forces for each of the eight projects.

The whitefly project has already attracted global interest, and efforts are underway to build donor support for it. Five international centers, several national programs in Africa and Latin America, two regional organizations, and two US universities are involved in developing the project's research program.

III. Financial and Budgeting Information

This discussion of the financial years 1995 and 1996 and of the 1997 funding request is based on information provided in Tables 1-11 of the Annex.

The 1995 Financial Year

The Core Budget

CIAT's base budget for 1994-1997 is $27.5 million, expressed in current dollars, with inflation to be absorbed by the Center. The revaluation of the Colombian peso—the currency of CIAT's host country, where the Center spends two-thirds of its budget—caused CIAT's overall inflation rate to be 9.5 percent above OECD inflation rates for 1994-1995.[1] Consequently, in late 1994 and throughout 1995, CIAT alerted the CGIAR that to finance its working budget based on a $27.5 million funding target would require an upward adjustment of the base by at least $2.1 million. Based on this projection, CIAT implemented a 1995 working budget of $29.9 million, exactly $2.1 million above the level of $27.8 million ($27.5 million for the base, plus $0.3 million for the cost of the EPMR).

Unfortunately, at ICW95 the CGIAR decided not to provide CIAT any relief for the erosion of CIAT's real budget, caused by the revaluation of the Colombian peso. In fact, by year's end it was clear that the CGIAR would not even be in a position to provide the full, unadjusted funding target of $27.8 million. ***The amount actually received was $26.7 million, or $1.1 million below target.*** The decision not to compensate CIAT for the extra inflation caused by the revaluation of the Colombian peso and underfunding of the base resulted in a ***funding shortfall in 1995 of $3.2 million***. Given a core program of $27.9 million (made up of $26.7 million from the CGIAR and $1.2 in self-generated income) and expenditures of $29.9 million, CIAT ran ***an operating deficit of $2.0 million for the 1995 fiscal year.***

In an effort to safeguard its operating fund balance, which at the beginning of 1995 was $3.0 million, the Center opted to take a charge of $2.0 million against its capital fund in order to deal with the operating deficit for 1995. Clearly, this use of resources in the capital fund cannot be justified in the medium- or long-term; however, under the circumstances—i.e., significant underfunding, whose dimensions became clear only toward the end of fiscal 1995—CIAT had little recourse but to proceed as described here.

The Non-Core Budget

Systemwide programs and initiatives: In the course of 1995, as convening Center for the Systemwide Tropical Latin America Program, CIAT spent $18,000. Similarly, as

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1. In fact, the revaluation process continued until early October 1995. During the period from 1 January 1994 to 30 September 1995, CIAT experienced a cost increase of $3.1 million over the OECD inflation rates, which would have called for an adjustment in the $27.5 million funding base to $30.6 million by the end of 1995.

convening Center for the Systemwide Initiative on Soil, Water, and Nutrient Management, CIAT spent $265,000. As a participant in other systemwide programs and initiatives, the Center carried out activities at a cost of $17,000.

Activities outside the research agenda: For project activities that do not form part of the agreed research agenda, CIAT received and spent $4.9 million.

The accompanying table summarizes total income and expenditures, as described above.

1995 Income and Expenditures: Budget vs. Actual
(in '000 of US$)

	Budget	Actual
Income		
Core Program	$ 27,500	$ 26,684
Adjustment for Revaluation Costs	$ 2,100	$ -
Costs of EPMR	$ 300	$ -
Systemwide Programs & Initiatives	$ 300	$ 300
Overhead and Other Income	$ 600	$ 1,207
Special Projects	$ 4,917	$ 4,917
Total Income	$35,717	$ 33,108
Expenditures		
Core Program	$ 29,600	$ 29,590
EPMR	$ 300	$ 300
Systemwide Programs & Initiatives	$ 300	$ 300
Special Projects	$ 4,917	$ 4,917
Total Expenditures	$35,117	$ 35,107
Surplus/(Deficit)	$ 600	$ (1,999)

The 1996 Working Budget

Financial Planning Parameters for the 1996 Fiscal Year
At ICW95 the CGIAR approved a 1996 financing plan for CIAT amounting to $27.5 million for the CIAT program per se, plus $0.9 million for the Tropical Latin America Program, and $0.9 million for the design phase of the Systemwide Initiative on Soil, Water, and Nutrient Management. In addition, CIAT projects self-generated income

of $1.5 million in fiscal 1996. Accordingly, **total expected income for the core program of CIAT amounts to $30.8 million**. Income for special projects, i.e., activities outside the 1996 CGIAR research agenda, is estimated at $4.4 million.

Discussion of a Balanced Budget
To continue in 1996 the 1995 CIAT program would require the following amounts (in US$000):

Cost of continuing the 1995 work program in fiscal 1996:
(Core only, 000)

Working budget in 1995	$29,600
+ Systemwide:	
Tropical Latin America Program	$900
Soil, Water, Nutrient Management	$900
+ Inflation cost	$1,000
Total required in 1996	**$32,400**

In view of the imbalance between expected income ($30.8 million), and projected expenditures ($32.4 million), CIAT is reducing activities amounting to $3.0 million so as to ensure a balanced budget and to heed the advice of the CGIAR Finance Committee to proceed with working budgets slightly below the level of expected income. Accordingly, **CIAT's Working Budget for 1996 is $29.4 million**, and CIAT is projecting a surplus of $1.6 million in fiscal 1996. However, the costs to CIAT of phasing out on-going activities amounting to $3.0 million are conservatively estimated at $2.0 million. CIAT therefore projects a net deficit in fiscal 1996 of $0.5 million.

Budget Request for 1997

Financial Planning Parameters for 1997 Fiscal Year
CIAT's financial planning framework for 1994-1997 has been fixed by the CGIAR at $27.5 million, expressed in current dollars (i.e., inflation in this period must be absorbed by CIAT). Added to this base amount are the budgets for systemwide initiatives and programs. Funding for the Tropical Latin America Program, as recommended by TAC, is at $1.8 million. Funding in 1997 for the CIAT-convened Systemwide Initiative on Soil, Water, and Nutrient Management (SWNM) is recommended by TAC at $1.0 million. Finally, TAC is recommending the allocation of $0.9 million for a systemwide initiative on participatory research.

At this stage 1997 funding for special projects is projected at $3.9 million. These parameters are summarized as follows:

Projected income in 1997 (US$000):

From CGIAR for core program	27,500	
Systemwide:		
Tropical Latin America Program	900	
Soil, Water, Nutrient Management	1,000	
Participatory Research	900	
Special projects	3,900	
Self-generated income	1,500	**35,700**

Using the 1996 proposed budget allocation as a base, the following 1997 expenditures are anticipated:

Projected expenditures in 1997 (in $000):

Core program	27,600	
Inflation cost	900	
Systemwide:		
Tropical Latin America Program	900	
Soil, Water, Nutrient Management	1,000	
Participatory Research	900	
Special projects	3,900	**35,200**
Projected surplus in 1997:		**500**

To summarize, CIAT is requesting from CGIAR donors the following financing for its core program in 1997 (in US$000):

Core	$27,500
Systemwide:	
Tropical Latin America Program	$900
Soil, Water, Nutrient Management	$1,000
Participatory Research	$900

IV. CIAT's Portfolio of Projects

Projects are the primary means by which CIAT attains the goals of its mandate areas and implements the strategies of its programs. Operating through projects offers a number of advantages:

- Strengthened output orientation in research
- Explicit correspondence to the new CGIAR programs
- Integration of efforts from diverse sources within CIAT
- Transparent accountability to stakeholders
- Flexibility to undertake new activities or complete activities
- Improved responsiveness to stakeholders' agenda
- Effective mechanism for joint ventures with partners
- Closer association of research and financial functions
- Basis for resource mobilization

CIAT's project portfolio consists of the following 22 projects:

1 Bean Yield Stability
2 Cassava Gene Pools
3 Rice Gene Pools
4 Enhancing Forage Grasses and Legumes
5 Bean Productivity in Latin America and the Caribbean
6 Bean Productivity in sub-Saharan Africa
7 Integrated Cassava Crop Management
8 Integrated Rice Crop Management
9 Utilization of Grasses and Legumes
10 New Land Use Systems for Tropical America
11 Soil Quality and Environmental Impact in Production Systems
12 Rural Agroenterprises
13 Conservation of Genetic Resources
14 Understanding Genetic Diversity
15 Broadening the Genetic Base
16 Tropical Grasses and Legumes for Multiple Uses
17 Impact Assessment
18 Strengthening Private and Public Linkages
19 Methods of Farmer Participation
20 Community Management of Watershed Resources
21 Land Use Change in Savannas and Forest Margins
22 Environmental Sustainability and Land Use Dynamics

Project #1: Improving the Yield Stability of Common Bean by Increasing Disease and Pest Resistance, Tolerance to Abiotic Stresses, and Yield Potential

Objective: To increase and stabilize bean yields by developing gene pools with pest and disease resistance, tolerance to abiotic stresses, and enhanced yield potential.

Outputs: New sources of resistance to biotic and abiotic constraints; characterization of the genetic diversity of major pathogens; integrated pest management practices; improved biological nitrogen fixation; increased tolerance to low soil fertility; effective breeding strategies to increase yield potential and adaptation.

Gains: Improved bean varieties will be grown on 20% of the production area. Bean lines with multiple resistance to diseases, insects, and abiotic stresses will be available to public and private breeding programs. Greater tolerance to drought and low soil fertility will increase bean productivity and permit expansion into marginal areas. Pesticide use will be reduced by 30% in targeted regions. The present value of CIAT's share of expected net benefits of this project is US$1.47 billion.

Duration: 5 years

1996	Gene combinations defined that confer stable resistance to anthracnose and angular leaf spot pathogens.
1998	Key resistance genes tagged to facilitate gene pyramiding; drought tolerance genes tagged.
1999	At least two mechanisms defined that confer phosphorus efficiency, including one for tolerance of BNF to low P.
2001	Varieties with stable resistance developed.

Users: New bean genotypes and crop management practices will improve the welfare of small-scale bean farmers (particularly in marginal environments of Latin America and Africa) by increasing their income from bean production, by reducing pesticide damage to human health and the environment, and by increasing protein and micronutrient intake, especially among women and small children.

Collaborators: Field selection of populations and identification of reliable sources of resistance and tolerance—PROFRIJOL, PROFRIZA, and EMBRAPA (Brazil). Mechanistic studies of low-P tolerance—NARS (Costa Rica), INRA. Tagging of critical resistance genes—Bean-Cowpea CRSP and Michigan State University (USA).

CG system linkages: Program 1 (85%), Program 2 (15%).

Project # 1: Bean Yield Stability	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	339.4	56.0	349.6	56.0
Other Personnel	520.2	13.0	535.8	13.0
Operations	22.7	38.4	23.4	39.0
Research Services	144.8	-	149.1	-
Central Services	319.7	-	329.3	-
Total	**1,346.8**	**107.4**	**1,387.2**	**108.0**
Financing Plan				
Unrestricted Core	1,346.8	-	1,387.2	-
Non-agenda financing				
France - Improved Efficiency of Bean	-	81.4	-	54.0
Iran - Improvement Disease Resistance	-	26.0	-	54.0
Total	**1,346.8**	**107.4**	**1,387.2**	**108.0**

Project #1: Improving the Yield Stability of Common Bean by Increasing Disease and Pest Resistance, Tolerance to Abiotic Stresses, and Yield Potential

Project purpose

To increase and stabilize bean yields by developing gene pools with pest and disease resistance, tolerance to abiotic stresses, and enhanced yield potential.

Outputs

Activities

Resistance to biotic stresses

- Identify new sources of disease and insect resistance, determine the mechanisms and inheritance of resistance, and incorporate resistance genes into major bean gene pools.
- Characterize the genetic diversity of major pathogens and their evolution with bean gene pools, using molecular and classical techniques.
- Develop integrated pest and pathogen management practices, using pilot IPM projects to train national scientists and farmers

Tolerance to abiotic stresses

- Develop genotypes that adapt to low soil P through improved acquisition, greater P-use efficiency, and symbiosis with vesicular-arbuscular mycorrhizal fungi (VAM).
- Improve biological nitrogen fixation by developing genotypes with better fixing capacity and N-use efficiency, improved *Rhizobium* strains, and simple systems for distributing inoculant.
- Develop genotypes tolerant to acid soils and/or calcium deficiency.
- Improve water use efficiency and adaptation to water deficits.

Improved yield potential

- Develop gene recombination and selection strategies in Andean and Mesoamerican gene pools to increase yields.
- Incorporate photoperiod and temperature insensitivity into Andean genotypes.

Project #2: Improved Cassava Gene Pools for Major Agroecologies in Latin America, Asia, and Africa

Objective: To develop cassava gene pools with improved yield, quality traits, and resistance or tolerance to major pests, diseases, and abiotic stresses.

Outputs: Sources of tolerance to biotic and abiotic constraints, improved breeding populations and cultivars, data on the socioeconomic impact of new varieties, and effective methods for germplasm screening.

Gains: The dry matter yield potential of elite cassava germplasm will increase. The area planted to CIAT-derived germplasm will expand. The area planted to cassava in marginal semiarid ecosystems will also expand. Adoption of new germplasm will raise annual crop value. And the nutrient-use efficiency of the germplasm will be enhanced, thus reducing nutrient requirements per ton of roots produced. The present value of CIAT's share of expected net benefits of this project is US$1.23 billion.

Duration: 5 years

1998	Models developed for introducing improved genetic diversity in farmers' fields.
1999	Whitefly and mite resistance mechanisms identified; cultivars with multiple pest resistance available; cultivars with multiple disease resistance available; regional breeding workshops held in Latin America and Asia.
2000	Mechanisms controlling yield stability under prolonged drought identified and selection criteria incorporated into breeding program.
2001	Elite genotypes, with the potential to increase productivity at the field level by 20% in lowland humid, 25% in subhumid, 40% in semiarid, 30% in highland, and 15% in subtropical environments, available to national programs.

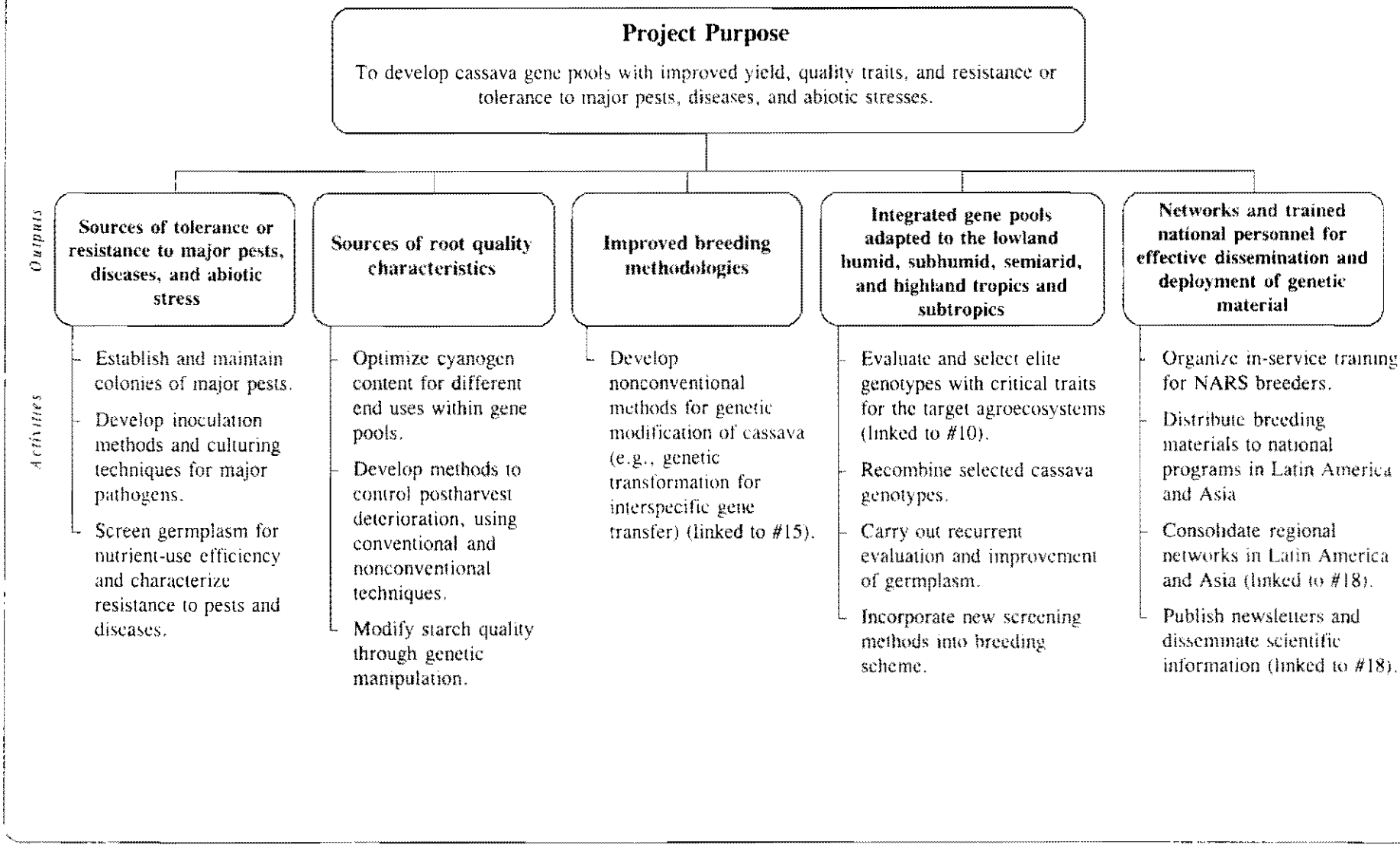
Users: New varieties will improve the diets and socioeconomic conditions of small-scale cassava farmers (particularly in marginal environments of the tropics and subtropics), processors, and poor urban consumers by increasing and stabilizing crop production, by enhancing the efficiency of postharvest processing, and by raising the quality of cassava products.

Collaborators: Breeding—EMBRAPA/CNPMF (Brazil), FCRI (Thailand), IITA. Evaluation—CORPOICA (Colombia), other NARS in Latin America and Asia.

CG system linkage: Program 1 (85%), Program 12 (10%), Program 9 (5%).

Project # 2: Cassava Gene Pools	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	389.6	-	401.3	-
Other Personnel	293.1	-	301.9	-
Operations	107.5	40.0	110.7	-
Research Services	137.9	-	142.0	-
Central Services	222.7	-	229.4	-
Total	**1,150.8**	**40.0**	**1,185.3**	**-**
Financing Plan				
Unrestricted Core	1,150.8	-	1,185.3	-
Non-agenda financing				
ORSTOM - Cassava Bacterial Blight	-	40.0	-	-
Total	**1,150.8**	**40.0**	**1,185.3**	**-**

Project #2: Improved Cassava Gene Pools for Major Agroecologies in Latin America, Asia, and Africa



Project #3: Improved Rice Gene Pools for Latin America and the Caribbean

Objective: To increase genetic diversity and enhance gene pools for higher, more stable rice yields.

Outputs: Sources of tolerance to biotic and abiotic constraints; improved breeding populations and cultivars; characterized progenitors for major traits of regional interest; effective methods for germplasm screening; and information on variety release, adoption, and impact.

Gains: The project will generate well-adapted varieties and provide national programs with better progenitors for crosses. It will also increase the exchange of information from local and regional trials. Wide adoption of improved germplasm will result in a more competitive rice sector, offering cheaper rice for consumers and gains for producers through greater efficiency and lower unit costs. During 1967-1990 the release of more than 250 new rice varieties in the region yielded benefits worth about US$150 million per year. The current phase of this project will create benefits of a similar magnitude.

Duration: 5 years

1996	New plant type crossed with local progenitors; yield trials of F2BC2 with wild rices and QTL analysis conducted.
1997	Second backcross made to improve new plant type; third backcross made with wild rice lines; recurrent selection populations for upland and irrigated rice delivered to national programs.
1999	Near isogenic lines available to national programs.
2000	Improved populations with new plant type available to national programs; near isogenic lines evaluated by national programs for variety release; upland rice varieties released in Colombia, Venezuela, Brazil, and Bolivia.

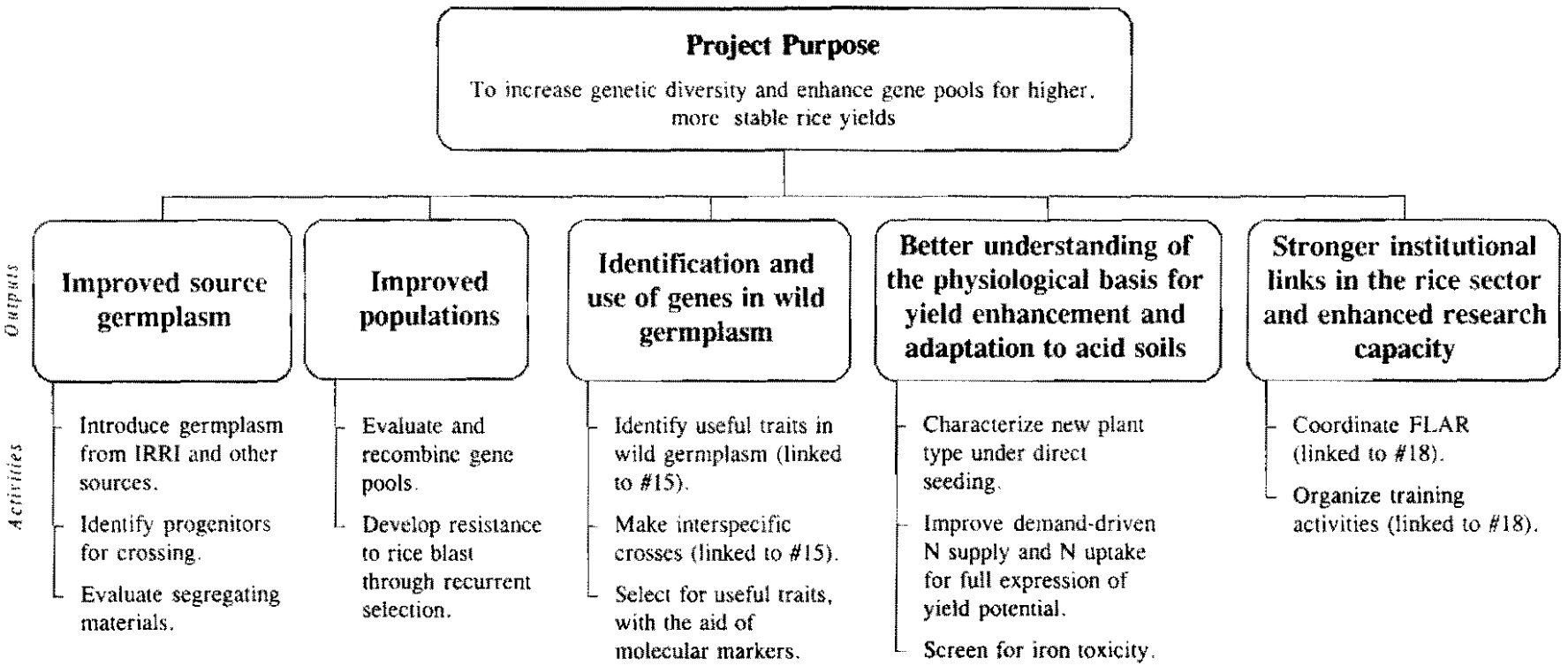
Users: This work will mainly benefit poor urban consumers in tropical America, where rice is a basic staple. In addition, the gains in production efficiency and the lower unit costs made possible by improved varieties will tend to lower pesticide use and reduce the pressure to expand rice onto new land.

Collaborators: Germplasm exchange—IRRI, WARDA, CIRAD, Texas A&M (USA). Breeding—IRRI, CIRAD, NARS in Latin America and the Caribbean. Wild rice crosses—Cornell University (USA).

CG system linkages: Program 1 (60%), Program 12 (30%), Program 9 (10%).

Project # 3: Rice Gene Pools	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	156.0	43.8	160.7	43.8
Other Personnel	152.1	38.4	156.7	38.4
Operations	50.6	93.8	52.1	93.8
Research Services	100.9	-	103.9	-
Central Services	115.2	-	118.6	-
Total	**574.8**	**176.0**	**592.0**	**176.0**
Financing Plan				
Unrestricted Core	439.8	-	453.0	-
Restricted Core				
Colombia - Rice Gene Pools	35.0	-	36.0	-
RF - Application of Rice Biotechnology	100.0	-	103.0	-
Non-agenda financing				
France - Upland Rice Gene Pools	-	30.0	-	30.0
Colombia - Improved Lowland Rice	-	146.0	-	146.0
Total	**574.8**	**176.0**	**592.0**	**176.0**

Project #3: Improved Rice Gene Pools for Latin America and the Caribbean



Project #4: Genetic Enhancement of Tropical Grasses and Legumes for Feed and Soil Improvement in the Subhumid and Humid Tropics

Objective: To improve the utility of commercially important tropical grasses and legumes by increasing their edaphic adaptation, feed quality, and tolerance to diseases and pests through the use of natural germplasm and genetic manipulation.

Outputs: New cultivars of important tropical grasses (*Brachiaria* and *Panicum*), herbaceous legumes (*Arachis* and *Stylosanthes*), and shrub legumes (*Cratylia* and *Leucaena*), with good adaptation to infertile soils and resistance to anthracnose (legumes) and spittlebug (grasses), for rehabilitation of degraded grazing lands, stabilizing hillsides, improving the soil, and increasing productivity in mixed farming systems.

Gains: New grass and legume cultivars will permit the development of more productive and sustainable forage components for crop-livestock and perennial tree crop systems, resulting in increased farm income and more stable prices for the consumer and more sustainable land use systems. The present value of CIAT's share of expected net benefits of this project is US$1.59 billion.

Duration: 5 years

1997	New genotypes of *Brachiaria*, *Arachis*, and *Stylosanthes* available for distribution.
1998	New shrub legume genotypes available for acid soils and subhumid environments.
1999	New cultivars of *Brachiaria*, *Arachis*, and *Stylosanthes* released by NARS.
2000	New shrub legumes released for acid soils and subhumid environments.

Users: This work will benefit government, nongovernment, and farmer organizations, commercial seed producers, and low-income farmers working in crop, crop-livestock, and perennial tree crop systems in the subhumid and humid regions of the lowlands and hillsides of tropical America, in the upland farming systems of Asia, and in the intensive crop-livestock systems of Africa.

Collaborators: Enhancement of *Brachiaria*, *Arachis*, and *Stylosanthes*—EMBRAPA (Brazil), CORPOICA (Colombia). Research on pathogens—CSIRO (Australia). Regional germplasm evaluation—RIEPT (Latin America), SEAFRAD (Asia), AFRNET (Africa).

CG system linkages: Program 1 (60%), Program 2 (20%), Program 3 (10%), Program 9 (5%), Program 12 (5%).

Project # 4: Enhancing Forage Grasses and Legumes	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	411.7	-	424.0	-
Other Personnel	296.1	22.8	305.0	22.8
Operations	72.1	81.0	74.3	77.2
Research Services	62.1	-	64.0	-
Central Services	147.0	-	151.4	-
Total	**989.0**	**103.8**	**1,018.7**	**100.0**
Financing Plan				
Unrestricted Core	734.1	-	756.2	-
Restricted Core				
Colombia -Enhanced Genetic Resources	254.9	-	262.5	-
Non-agenda financing				
FEDEGAN - Resistence to Spittle Bug	-	35.0	-	37.0
JIRCAS - Plant Ecology	-	18.0	-	-
NESTLE - Development Dual Purpose	-	50.8	-	63.0
Total	**989.0**	**103.8**	**1,018.7**	**100.0**

Project #4: Genetic Enhancement of Tropical Grasses and Legumes for Feed and Soil Improvement in the Subhumid and Humid Tropics

Project Purpose

To improve the utility of commercially important tropical grasses and legumes by increasing edaphic adaptation, feed quality and tolerance to diseases and pests through use of natural germplasm and genetic manipulation

Outputs

Activities

Mechanisms, sources, and genetic characterization of key plan attributes

- Assess and characterize spittlebug resistance in *Brachiaria*.
- Characterize anthracnose in *Stylosanthes*.
- Evaluate disease susceptibility *Arachis Pintoi*.
- Conduct epidemiological studies of main diseases of legumes.
- Assess virus resistance in *Brachiaria*.
- Identify nutrient-efficient genotypes (linked to #11).
- Investigate abiotic attributes affecting persistence in associations.
- Evaluate plant attributes contributing to soil improvement.
- Assess feed quality attributes and genetic control.

Superior grass cultivars

- Evaluate promising accessions and lines of *Brachiaria*, *Panicum* and *Paspalum* for production systems (linked to #10).
- Breed improved gene pools of *Brachiaria* with edaphic adaptation and insect resistance.
- Investigate genetic control and identify molecular markers for key attributes, including apomixis (linked to #15).
- Enhance edaphic adaptation of grasses (linked to #11).
- Evaluate feed value of grasses.

Superior legume cultivars

- Evaluate promising accessions of *Stylosanthes* and *Arachis* for production systems.
- Evaluate promising accessions of the shrubs, *Cratylia* and *Leucaena* for production systems.
- Enhance disease resistance in *Stylosanthes*.
- Evaluate feed value of legumes.
- Investigate disease resistance through transformation (linked to #15).

Seed for research and national partners

- Multiply promising accessions and advanced lines of grasses and legumes.
- Investigate factors affecting seed quality.
- Investigate seed production and storage methodologies that are appropriate to national partners.
- Distribute seed through a revolving seed fund.

Project #5: Improving Bean Productivity in Latin America and the Caribbean through Gene Pool Development and Regional Networks

Objective: To improve bean productivity in Latin America by deploying gene pools that help solve major production constraints and by supporting networks for applied research.

Outputs: Improved gene pools and breeding populations with multiple stress resistance and acceptable seed types (the distribution of these will be targeted with the aid of a classification of bean environments based on agroecological and biological data); strengthened research capacity and more effective priority setting in regional bean networks (PROFRIJOL and PROFRIZA) and in Brazil; ecologically sound crop and pest management practices; and nonformal methods of seed production and distribution.

Gains: Resistant varieties will be grown on most of the bean production in Central America, and bean productivity will increase significantly in the Andean Zone. In Brazil about 500,000 hectares will be planted to modern bean cultivars. Regional networks will be fully devolved to local management, with CIAT participating as a research partner. The present value of CIAT's share of expected net benefits of this project is US$376 million.

Duration: 3 years

1998	NARS in the Andean zone promoting viable methods for erosion control in bean production.
1999	PROFRIJOL produces new lines with multiple resistance, demonstrating its strengthened research capacity.
2001	Bean yields continue to grow at 3% per year, and marginal land planted to beans is reduced.

Users: Increased research collaboration and technology exchange in the region will speed the acquisition of new germplasm and methods by national programs. This in turn will better enable them to conduct research and develop technology in a timely manner for small-scale farmers in both marginal and favorable production areas. Increasing numbers of small-scale seed producers will further accelerate the flow of new germplasm into farmers' fields.

Collaborators: Testing of erosion control methods—PROFRIZA. Developing varieties with multiple resistance—PROFRIJOL, PROFRIZA, EMBRAPA (Brazil), Bean-Cowpea CRSP.

CG system linkages: Program 1 (45%), Program 2 (25%), Program 6 (15%), Program 12 (15%).

Project # 5: Bean Productivity in Latin America and the Caribbean	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	172.5	-	177.7	-
Other Personnel	47.0	53.0	48.4	40.0
Operations	212.1	88.9	218.5	39.0
Research Services	67.1	-	69.1	-
Central Services	146.6	-	151.0	-
Total	**645.3**	**141.9**	**664.7**	**79.0**
Financing Plan				
Unrestricted Core	645.3	-	664.7	-
Non-agenda financing				
SDC - Sustaining Bean Productivity LA	-	14.0	-	15.0
France - Improved Efficiency of Bean	-	44.9	-	54.0
IDRC - Development of Bean	-	83.0	-	10.0
Total	**645.3**	**141.9**	**664.7**	**79.0**

Project #5: Improving Bean Productivity in Latin America and the Caribbean through Gene Pool Development and Regional Networks

Project Purpose

To improve bean productivity in Latin America by deploying gene pools that help solve major production constraints and by supporting networks for applied research.

Outputs

Activities

Improved germplasm

- Distribute Mesoamerican and Andean germplasm with resistance or tolerance to major constraints among national programs and form regional nurseries for dissemination of elite materials among network partners.
- Develop collaborative farmer participatory breeding projects for the development of new bean varieties (linked to #19).

Network development

- Participate and provide technical input into PROFRIJOL, PROFRIZA, and Brazilian research networks. Assist in training events and workshops (linked to #18).
- Establish ways for network members to assume responsibility for project management through participatory planning, which involves researchers as well as other people working in bean production (e.g., seed specialists, extension agents, and farmers) (linked to #18).
- Participate in network training events, monitoring tours, conferences, and workshops, and design collaborative research projects with national programs (linked to #18).

Integrated bean production systems

- In collaboration with national institutions, develop, test, and promote sustainable crop management practices, including no-till cropping, erosion control barriers, green and organic manures, intercropping, and IPM systems (linked to #19).
- Develop novel methods for seed multiplication and distribution to speed testing and adoption of new bean varieties (linked to #12).
- Participate in interprogram and intercenter projects on natural resource management in Central America, the Andean Zone, and Brazil, focusing on soil and water conservation and prototype system development (linked to #10).

Project #6: Improving Bean Productivity in Sub-Saharan Africa through Gene Pool and Cropping System Development and Regional Networks

Objectives: To improve bean productivity in sub-Saharan Africa by deploying gene pools that help solve major production constraints and by supporting networks for applied research.

Outputs: Improved gene pools, breeding populations, and mixtures with multiple stress resistance (the distribution of these will be targeted with the aid of a classification of bean environments based on agroecological and biological data); strengthened research capacity and more effective priority setting in regional bean networks (ECABREN and the SADC-Southern Africa Bean Network); ecologically sound crop, soil, and pest management practices; nonformal methods of seed production and distribution.

Gains: Varieties resistant to multiple stresses will occupy about 200,000 hectares (5% of the bean production area) in network countries. Farmers growing the new varieties will see a 10% increase in their income from marketing of beans. Five percent of farmers in the region will have adopted improved crop management practices; and regional networks will be fully devolved to local management, with CIAT participating as a research partner. The present value of CIAT's share of expected net benefits of the outputs of this project is US$352 million.

Duration: 5 years

1997	Pan-Africa network is a functional unit, integrating bean research in all of eastern and southern Africa.
1998	Climbing beans widely adopted in Kenya and at least one other country.
1999	Lines resistant to bean fly available; line with multiple disease resistance developed.
2000	Farmers starting to adopt new agronomic practices, including erosion control measures and use of green manures.

Users: Increased research collaboration and technology exchange in the region will speed the acquisition of new germplasm and methods by national programs. This in turn will better enable them to conduct research and develop technology in a timely manner for small-scale farmers (mainly women) in both marginal and favorable production areas. Increasing numbers of small-scale seed producers will further accelerate the flow of new germplasm into farmers' fields.

Collaborators: Development of improved germplasm—regional networks of NARS. Diffusion of new technology—NGOs (including churches and relief agencies).

CG system linkages: Program 1 (30%), Program 2 (30%), Program 6 (10%), Program 9 (10%), Program 12 (20%).

Project # 6: Bean Productivity in sub-Saharan Africa	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	804.6	163.3	828.8	163 3
Other Personnel	211.6	136.6	217.9	136 6
Operations	668.0	978.1	688.0	638 1
Research Services	23.4	-	24 1	-
Central Services	47.3	-	48.7	-
Total	**1,754.9**	**1,278.0**	**1,807.5**	**938.0**
Financing Plan				
Unrestricted Core	203.9	-	210.0	-
Restricted Core				
PABRA - Bean Research in SSA	1.551.0	-	1,597 5	-
Non-agenda financing				
ODA - Bean Improvement Malawi	-	308.0	-	304 0
PABRA - Bean Africa Network	-	678 0	-	578 0
RF - Farmer Participatory Research		56.0		56 0
Seeds of Hope Consortium	-	236.0	-	-
Total	**1,754.9**	**1,278.0**	**1,807.5**	**938.0**

Project #6: Improving Bean Productivity in Sub-Saharan Africa through Gene Pool and Cropping System Development and Regional Networks

Project Purpose

To improve bean productivity in sub-Saharan Africa by deploying gene pools that help solve major production constraints and by supporting networks for applied research

Outputs

Activities

Improved germplasm

- Characterize bean growing environments, using climatic, edaphic, and biological data, and group the environments according to uniformity of bean genotype response to permit more precise targeting of improved germplasm.
- Distribute Andean and Mesoamerican germplasm with resistance or tolerance to major constraints among national programs and other organizations for testing.
- Distribute pan-Africa breeding nurseries and trials (containing superior lines and germplasm developed or evaluated in Africa) to network participants.

Network development

- Identify means by which PABRA network members can take greater responsibility for managing projects and implementing strategies defined by steering committees and researchers in periodic, regional planning meetings (linked to #18).
- Participate in network training events, monitoring tours, conferences, and workshops and design collaborative research projects with national programs to solve important production constraints in the region (linked to #18).
- Develop IPM components and strategies to reduce losses caused by pests and diseases in major production systems.

Seed distribution

- Develop innovative seed multiplication and distribution systems to promote testing and adoption of new varieties.
- Use farmer participatory varietal development methods to produce bean varieties and distribute seed within regions having limited access to new technologies (linked to #19).

Integrated bean production systems

- In collaboration with national institutions, develop, test, and promote sustainable crop management practices, including no-till cropping, erosion control practices, live barriers, green and organic manures, intercropping, and IPM systems.
- Through farmer participatory research, develop management practices that combine green manures, erosion control, selective intercropping, and tolerant varieties to overcome constraints associated with low soil fertility and low crop productivity (linked to #19).

Project #7: Integrated Cassava Crop Management in Major Agroecosystems of Latin America and Asia

Objective: To promote sustainable cassava production by developing component technologies and principles for integrated crop management in major agroecosystems of Latin America and Asia.

Outputs: Integrated pest and crop/soil management practices for cassava-based systems that permit minimal or no pesticide use and low inputs of chemical fertilizer.

Gains: Dry matter yield in cassava-based systems will increase by up to 30%. Production costs and soil erosion will decline, and soil fertility will improve over the long term. More stable and sustainable cassava productivity will improve farmers' incomes through reduced risk of crop loss. The present value of CIAT's share of expected net benefits of the outputs of this project is US$1.39 billion.

Duration: 5 years

1997	Field-level methodologies developed for the release and establishment of phytoseiid mites; field-level biological and cultural control practices for the cassava burrowing bug available.
1998	Management components for control of soil erosion in cassava-based cropping systems in hillsides evaluated in technical and economic terms and validated by farmers.
1999	Methodologies for farmer participation in developing integrated pest management, soil conservation, and fertility management strategies tested on a pilot scale at sites in Latin America and Asia.
2000	Potential for using semidwarf genotypes and related propagation systems determined.
2001	Biological control components for whitefly available.

Users: The technology generated through this work will benefit mainly small-scale cassava farmers by increasing productivity, lowering costs, and reducing environmental damage. Society as a whole will benefit through a reduction in off-farm effects, such as soil erosion and sedimentation of rivers. National research and development programs will gain from collaboration in research conducted at representative sites in various ecosystems, from improved research methodologies, and from knowledge on pest and crop/soil management.

Collaborators: Strategic research on pest and soil management—ETH (Switzerland), Royal Veterinary and Agricultural University (Denmark), University of Hohenheim (Germany), EMBRAPA/CNPMC and /CPDA (Brazil), IITA. Applied and adaptive research—DOAE (Thailand), MACIF (Indonesia), SCATC (China), CORPOICA (Colombia), state organizations in Northeast Brazil, NARS in various Latin American and Asian countries.

CG system linkages: Program 6 (50%), Program 2 (35%), Program 9 (15%).

Project # 7: Integrated Cassava Crop Management	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	358.1	143.1	368 8	143 1
Other Personnel	260.1	148 0	267.9	152.2
Operations	233.0	228.8	240.0	277.7
Research Services	74.8	-	77.0	-
Central Services	127.7	-	131.6	-
Total	**1,053.7**	**519.9**	**1,085.3**	**573.0**
Financing Plan				
Unrestricted Core	644.7	-	664.0	-
Restricted Core				
UNDP - Integrated Pest and Disease	409.0	-	421 3	-
Non-agenda financing				
Sasakawa - Improving Agricultural Sust.		308.6		347.0
BMZ/GTZ - Soil Conservation	-	211.3	-	226.0
Total	**1,053.7**	**519.9**	**1,085.3**	**573.0**

Project #7: Integrated Cassava Crop Management in Major Agroecosystems of Latin America and Asia

Project purpose

To promote sustainable cassava production by developing component technologies and principles for integrated crop management in major agroecosystems of Latin America and Asia.

Outputs

Crop, soil, and pest management components and implementation strategies

Improved propagation systems

Networks and trained national personnel for effective technology design and adaptation

Activities

- Identify and quantify pest and disease complexes in selected agroecosystems.
- Identify and quantify soil degradation in cassava-based systems.
- Develop biological, botanical, and cultural practices to control selected cassava pests and diseases and soil erosion and to maintain soil fertility, with farmer participation (linked to #19).
- Develop implementation strategies through pilot projects in selected agroecosystems (linked to #12).

- Explore the potential of semidwarf genotypes for sustainable production.
- Refine conventional cassava propagation techniques.- Incorporate photoperiod and temperature insensitivity into Andean genotypes.

- Organize in-service and other training for national program scientists and extension leaders (linked to #18).
- Establish national and regional crop management networks in Latin America and Asia (linked to #18).
- Publish newsletters and disseminate scientific information (linked to #18).

Project #8: Integrated Rice Crop Management for Latin America

Objective: To develop technologies that reduce unit production costs of rice and avoid environmental contamination.

Outputs: Enhanced ICM components and principles; information on rice pests and their interactions with the crop; a better understanding of resistance mechanisms, breakdown, and stability and of pest epidemiology; and IPM components and strategies.

Gains: The ex-ante benefits of more efficient use of inputs, with varietal resistance maintained at its current level, has been estimated in some US$600 million per year, which go mainly to urban consumers.

Duration: 3 years

1997	Transgenic plants evaluated for HBV resistance.
1998	Genetic structure of blast pathogen characterized for virulence and genetic families in main rice-producing areas.
1999	Potential progenitors with most relevant blast resistance genes available to NARS.
2000	Transformed plants tested for HBV and herbicide resistance by national programs.

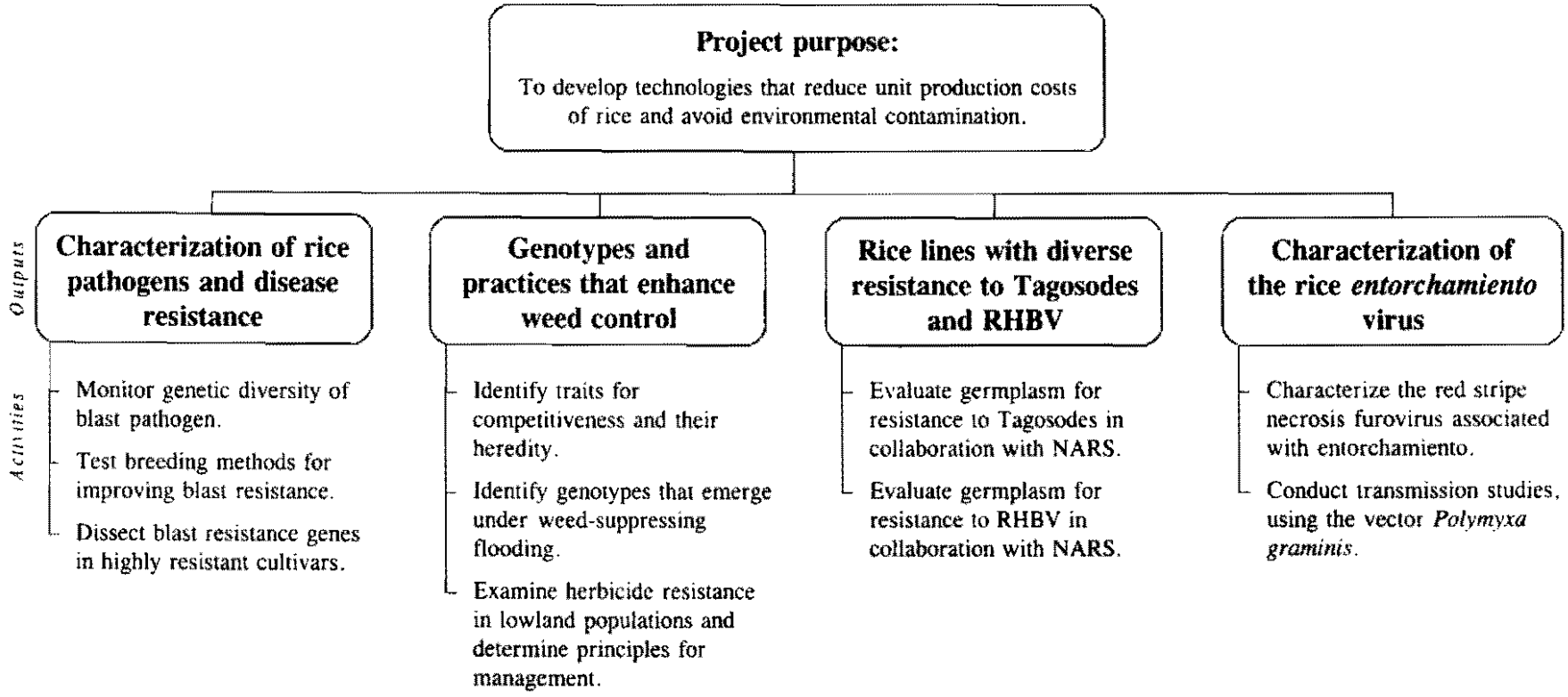
Users: Rice producers will gain, as more efficient and rational use of pesticides translates into lower unit costs and higher profits; consumers will benefit through lower prices; and society as a whole will benefit from reduced environmental pollution.

Collaborators: Strategic research for control strategies—IRRI, Purdue University (USA), CIRAD. Integration of control strategies—NARS.

CG system linkages: Program 6 (40%), Program 1 (30%), Program 9 (20%), Program 12 (10%).

Project # 8: Integrated Rice Crop Management	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	233.6	-	240.6	-
Other Personnel	192.1	-	197.9	-
Operations	36.7	51.5	37.8	5.0
Research Services	98.3	-	101.2	-
Central Services	153.0	-	157.6	-
Total	**713.7**	**51.5**	**735.1**	**5.0**
Financing Plan				
Unrestricted Core	548.3	-	564.7	-
Restricted Core				
Colombia - Integrated Rice Improvement	139.4	-	143.6	-
RF - Genetic Transformation	26.0	-	26.8	-
Non-agenda financing				
ODA - Integrating Rice Improvement	-	35.5	-	5.0
JIRCAS - Physiological Mechanisms	-	16.0	-	-
Total	**713.7**	**51.5**	**735.1**	**5.0**

Project #8: Integrated Rice Crop Management for Latin America



Project #9: Utilization of Tropical Grasses and Legumes in Production Systems of the Subhumid and Humid Tropics

Objective: To develop and deploy selected grasses and legumes as components in production systems of the subhumid and humid tropics in collaboration with other organizations.

Outputs: A generic methodology for introducing improved grasses and legumes into farming systems; stable grass-legume pastures for the humid tropics; fodder grasses and shrub legumes for dry season supplementation; legumes for fallow improvement; legumes for use as soil covers in tree crops; forages for intensive smallholder systems; and grasses and legumes for renovation of degraded lands, with positive economic returns for farmers and beneficial environmental impacts for the community.

Gains: Farm incomes will increase as a result of higher productivity and lower production costs, leading to more stable prices of livestock products for the consumer. Production systems will be more stable, contributing to more sustainable land use practices. In Latin America new forage systems should give an IRR of 50-80% on research inputs and a current net value of social benefits of US$1 to 1.7 billion over 25 years. NARS' capabilities will be strengthened.

Duration: 5 years

1997	*Arachis*-based pastures available for smallholder dairy producers in the humid tropics.
1998	Forage-based systems for dry season supplementation in Central America.
1999	Legumes available for improvement of fallow lands.
2000	Forage components available for a variety of intensive production systems in Southeast Asia; new forages available for renovation of degraded pasture lands.

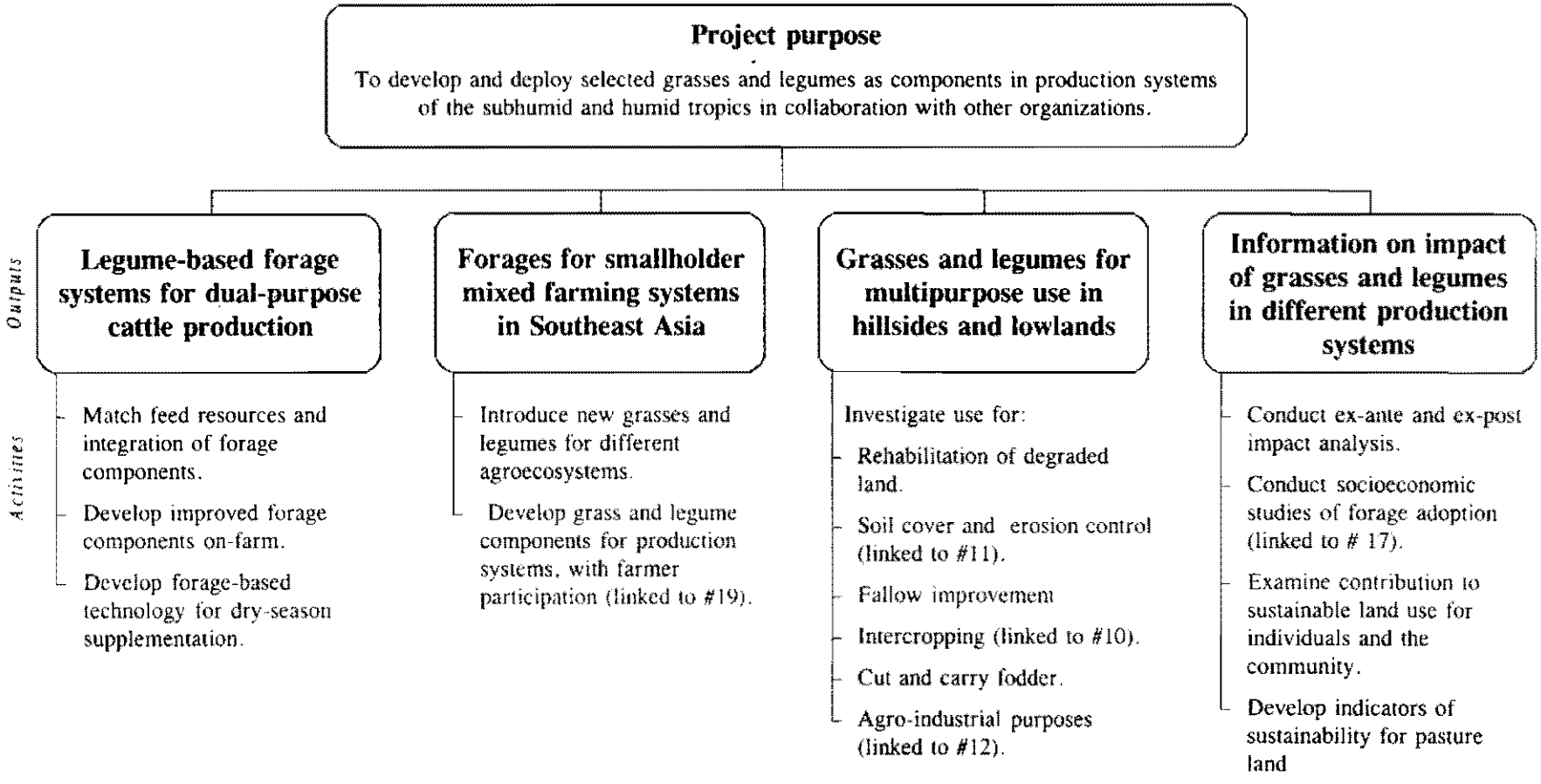
Users: These products will increase the productivity and raise the living standards of farmers managing arable crops, mixed arable crop-livestock systems, and perennial crops throughout the subhumid and humid tropics, while maintaining soil fertility, conserving water, and preserving the natural vegetation in critical areas of the landscape.

Collaborators: Research on legume-based systems for dual-purpose cattle: ILRI, Cornell University (USA), Latin American NARS. Work on forages for smallholders in Southeast Asia—IRRI, CSIRO, NARS. Work on legume covers—CENICAFE (Colombia) and industrial organizations in Central America. Renovation of degraded lands—EMBRAPA (Brazil), CORPOICA (Colombia), CIAT-SC (Bolivia).

CG system linkages: Program 3 (40%), Program 2 (30%), Program 6 (10%), Program 9 (10%), Program 12 (10%).

Project # 9: Utilization of Grasses and Legumes	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	280.3	-	288.7	-
Other Personnel	173.3	86.0	178.5	71.0
Operations	235.8	123.2	242.9	35.0
Research Services	33.9	-	34.9	-
Central Services	79 4	-	81 8	-
Total	**802.7**	**209.2**	**826.8**	**106.0**
Financing Plan				
Unrestricted Core	414.1	-	426.6	-
Restricted Core				
Australia - Forages for Small-holders	338.2	-	348.3	-
Colombia - Stylosanthes cultivars	50.4	-	51.9	-
Non-agenda financing				
NESTLE - Development for Dual Purpose	-	78.2	-	63 0
BMZ/GTZ - Interaction Desmodium Oval.	-	94 4	-	43.0
Australia - Development Forages	-	36.6	-	-
Total	**802.7**	**209.2**	**826.8**	**106.0**

Project #9: Utilization of Tropical Grasses and Legumes in Production Systems of the Subhumid and Humid Tropics



Project #10: Integrated Management of Production and Conservation in New Land Use Systems for Tropical America

Objective: To identify strategic principles for innovative management of ecologically and economically sound production systems.

Outputs: Integrated principles and procedures for combining ecologically sound practices with highly productive germplasm in new systems for managing mixed farming enterprises.

Gains: Guidelines and management principles will be available for enhancing biodiversity in agropastoral production systems through the integration of multipurpose legumes, crops, and animals. Generally applicable techniques and methods will be available to enable users to monitor and interpret data on trends in production, the regeneration of resources, and conservation in new integrated systems. Principles and guidelines will be developed to help researchers and farmers make adjustments in system management.

Duration: 5 years

1996	Yearly subregional workshops initiated.
1997	First prototypes of improved land use systems available; ex ante analysis of selected alternatives completed.
1998	Input/output budgets and ex-post economic analysis of existing systems completed; first management techniques and germplasm available for reclaiming degraded lands; whole farm bioeconomic models; NARS staff trained.

Users: This work will mainly benefit low-income farmers and urban consumers in tropical America by improving their food security and incomes, by ensuring the long-term productive capacity of farm land, and by protecting the natural resource base. Widespread adoption of conservation practices in farming will also benefit society at large, but particularly the inhabitants of fragile environments.

Collaborators: Field research—CIRAD-EMVT, CONDESAN. Models—IFDC, University of Hohenheim (Germany), Florida State University (USA), University of Uberlandia (Brazil).

CG system linkages: Program 6 (60%), Program 2 (25%), Program 12 (10%), Program 3 (5%).

Project # 10: New Land Systems for Tropical America	WORKING BUDGET 1996		Estimated 1997	
	CGIAR Resarch Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	441.0	-	454.2	-
Other Personnel	250.0	-	257.5	-
Operations	365.0	-	376.0	-
Research services	64.5	-	66.4	-
Central services	108.4	-	111.7	-
Total	**1,228.9**	-	**1,265.8**	-
Financing Plan				
Unrestricted Core	829.9	-	854.8	-
Restricted Core				
SDC - Improving Agricultural Sustain..	173.0	-	178.2	-
Colombia - Prouduction Systems	51.0	-	52.5	-
IDB - Participatory Research	175.0	-	180.3	-
Total	**1,228.9**	-	**1,265.8**	-

Project #10: Integrated management of production and conservation in new land use systems for Tropical America

Project Purpose

To identify strategic principles for innovative management of ecologically and economically sound production systems.

Outputs / *Activities*

Components of ecologically sound production systems

- Conduct component research to identify germplasm for acid soils (linked to #1, 2, 3, 4).
- Evaluate elite germplasm of cassava, beans, rice, and forages for systems research in sites homologous to the hillside and lowland agroecosystems (linked to #1, 2, 3, 4).
- Evaluate potential combinations of other crops for inclusion in systems (linked to #5, 6, 7, 8, 9).
- Measure the effect of conservation practices on crop production.

Quantitative estimates of the production and conservation tradeoffs between alternative prototypes

- Develop whole farm models of farmers' allocation of resources to different production and conservation alternatives.
- Examine farmer decision making about conservation and production tradeoffs.
- Conduct microeconomic evaluation of alternative prototypes (linked to #5, 6, 7, 8, 9).
- Conduct ex-ante analysis of adoptability of improved systems (linked to #17).
- Value environmental impact of incorporating innovative combinations of species into different production systems (linked to #17).

Concepts and principles for integrated management of production and conservation in ecologically sound systems

- Monitor alternative land uses on-far to quantify input/output ratios.
- Evaluate long-term biophysical tradeoffs in agropastoral, crop rotations, systems with trees, and native vegetation systems (linked to #5, 6, 7, 8, 9).
- Evaluate compatible crop, pasture, tree, and animal combinations and management practices with farmer participation (linked to #19).
- Integrate soil improvement technologies into systems to regenerate and improve the soil (linked to #12).
- Develop integrated weed and pest management practices.

Monitoring and evaluation of the dynamics of biodiversity and soil and water conservation in improved systems

- Inventory and study the dynamics and management of native vegetation.
- Examine the effects of management practices on soil fauna influencing soil quality (linked to #11).
- Monitor the effect of different land use systems at the farm and watershed level, using soil and plant indicators (linked to #12).
- Increase soil water storage capacity and diminish soil and water losses (linked to #11, 20).
- Assess on-farm impact of improved systems on water quality.
- Examine the effect of introduced species on degraded fallows.
- Characterize changes in plant community and biodiversity as a function of land use (linked to #21, 22)

Enhanced institutional capacity to develop, conduct, and transfer knowledge of alternative land uses

- Organize and coordinate yearly agropastoral workshops with the Lowlands Agropastoral Systems Network (linked to #18, 21).
- Supervise graduate and undergraduate theses.
- Promote and participate in specialized training courses.
- Publish results in refereed journals and other publications.
- Organize yearly workshops with the Central American Hillsides Consortium and CONDESAN for the Andean hillsides (linked to #18, 20)

Project #11: Biophysical Processes Affecting Soil Quality and Environmental Impact in Agropastoral and Sequential Crop Production Systems

Objective: To improve soil quality and reduce deleterious environmental impacts of agriculture through a mechanistic understanding of soil-plant processes in tropical hillside and lowland agroecosystems.

Outputs: Agropastoral and crop rotation systems that increase productivity while preserving natural resources; increased soil quality in terms of nutrient retention, cycling capacity, and structure and reduced soil erosion; improved models of integrated soil-plant systems for medium- and long-term assessment of changes in soil quality and productive capacity; and indicators of changes in soil quality.

Gains: Soil chemical, physical, and biological processes that affect the efficiency of nutrient cycling and inputs, the conservation of soil organic matter, and the maintenance or improvement of soil structure will be quantified. Soil quality indicators will be identified and verified in on-farm experiments. Progress in the development of crop and soil-plant models based on quantified processes will permit the extrapolation of results in the development of alternative prototype systems that improve nutrient-use efficiency.

Duration: 5-10 years

1997	Indicators of soil quality (chemical and physical) available.
1998	Indicators of soil quality (biological) available.
1999	Methods transferred to NARS.
2000	Nutrient (P, N) cycling models used as inputs to formulate more sustainable land use systems; improved methods available for managing soil fauna; techniques available for managing plant residues effectively.
2001	Indicators of off-site impacts available.

Users: Principally crop and livestock producers in acid soil environments of Latin America. This work is also relevant to farmers in tropical agroecosystems of Africa and Asia (savannas, hillsides and forest margins) that are characterized by infertile acid soils.

Collaborators: Field research—CORPOICA (Colombia), EMBRAPA (Brazil), IFDC, Cornell and Ohio State Universities (USA), University of Complutense (Spain), ORSTOM. Modelling—IFDC and Cornell University (USA).

CG system linkages: Program 6 (60%), Program 2 (20%), Program 12 (10%), Program 3 (5%), Program 9 (5%).

Project # 11: Soil Quality and Environmental Impact	WORKING BUDGET 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	418.5	-	431.1	-
Other Personnel	240.0	-	247.2	-
Operations	304.0	-	313.1	-
Research services	33.6	-	34.6	-
Central services	60.5	-	62.3	-
Total	**1,056.6**	-	**1,088.3**	-
Financing Plan				
Unrestricted Core	467.1	-	481.1	-
Restricted Core				
SDC - Improving Agricultural Sustain..	198.5	-	204.5	-
Colombia - Prouduction Systems	191.0	-	196.7	-
IDB - Participatory Research	200.0	-	206.0	-
Non-agenda Financing				
Total	**1,056.6**	-	**1,088.3**	-

Project #11: Biophysical Processes Affecting Soil Quality and Environmental Impact in Agropastoral and Sequential Crop Production Systems

Project purpose

To improve soil quality and reduce deleterious environmental impacts of agriculture via a mechanistic understanding of soil/plant processes in tropical hillside and lowland agroecosystems.

Outputs

Knowledge of limiting soil chemical, physical, and biological processes and of soil and water quality indicators

Strategies for soil improvement

Production and process models

Activities

- Study processes nutrient acquisition and nitrogen fixation (linked to #1, 2, 3, 4).
- Quantify and improve nutrient cycling, with emphasis on soil organic matter dynamics (linked to #5, 7, 8, 9, 10).
- Quantify soil physical limitations.
- Monitor water quality indicators.
- Determine the impact of land use systems on soil and water quality (linked to #20, 21).
- Determine the role of soil macrofauna in nutrient cycling.

- Develop systems and methods to manipulate soil fauna.
- Develop and test technologies to reduce soil constraints, including use of mulches, tillage, and integration of plant components (linked to #5, 7, 8, 9, 10).

- Calibrate models for predicting system responses to land management (linked to # 20, 21, 22).
- Identify rate-limiting processes through models.
- Integrate findings and identify knowledge gaps.
- Identify opportunities to enhance nutrient cycling and soil conservation.
- Evaluate off-site impacts of pollutants (linked to #20, 21, 22).

Project #12: Promoting Sustainable Production Systems and Environmental Conservation through Rural Agroindustrial Enterprises for Smallholders

Objective: To develop methodologies for designing and establishing small-scale, rural agroindustries, linking market opportunities, production and processing technology, and environmental conservation.

Outputs: A methodology for designing and developing small-scale, rural agroindustrial enterprises; for linking market opportunities, production, and processing technology; and for promoting environmental conservation.

Gains: Beneficiaries will gain an enhanced capacity to establish viable small-scale agroindustrial enterprises. Backward and forward linkages between environmental conservation, production, value-added processing, markets, and consumers will be improved. Sustainable production practices catalyzed by these linkages will be adopted more widely and rapidly.

Duration: 5 years

1997	Market opportunities identified and screened at pilot sites selected in Colombia, Honduras, Peru, and Brazil; design and operating manuals developed for small-scale cassava starch production; case studies on rural enterprise projects, including farmer seed systems, completed.
1998	At least three production, processing, and marketing projects established in target regions.
2000	Guidelines available for designing institutional support structures for rural agroindustry.
2001	Expert system available for designing integrated production, processing, and marketing agroenterprises.

Users: The immediate beneficiaries are the scientific and technical personnel of government and nongovernment organizations involved in rural agroindustrial research and development as well as rural policy makers. The ultimate beneficiaries are the inhabitants of rural areas, especially small-scale women farmers, middlemen, and entrepreneurs, who will profit from training and information on market opportunities linked to postharvest processing technologies, better market analysis, business training, and better support services.

Collaborators: Development of methods and technology components—CIRAD, NRI, PRODAR (Costa Rica), IDRC, IITA, CIP. Execution of pilot projects: CORPOICA (Colombia), IHCA and EAP (Honduras), FUNDEAGRO and CODESU (Honduras), EMBRAPA and CERAT (Brazil). Training and networking—PRODAR (Costa Rica).

CG system linkages: Program 6 (50%), Program 2 (30%), Program 9 (10%), Progam 12 (10%).

Project # 12: Rural Agroenterprises	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	155.8	35.0	160.5	35.0
Other Personnel	101.4	26.8	104.4	57.0
Operations	56.3	-	58 0	-
Research Services	6.0	-	6 2	-
Central Services	14.5	-	14 9	-
Total	**334.0**	**61.8**	**344.0**	**92.0**
Financing Plan				
Unrestricted Core	334.0	-	344.0	-
Non-agenda financing				
CIRAD - Food Technology	-	35.0	-	35.0
France - Regional Cooperation	-	26.8	-	57.0
Total	**334.0**	**61.8**	**344.0**	**92.0**

Project #12: Promoting Sustainable Production Systems and Environmental Conservation through Rural Agroindustrial Enterprises for Smallholders

Project Purpose

To develop methodologies for designing and establishing small-scale, rural agroindustries, linking market opportunities, production and processing technology, and environmental conservation.

Outputs

Methods for selecting potential markets that stimulate environmentally sound production practices

Activities

- Define criteria for selecting target ecosystems and crop products (linked to #5, 7, 9, 10).
- Select pilot regions and sites.
- Design and execute market studies.
- Define evaluation criteria, screen identified market opportunities, and determine users' criteria for acceptability of options
- Execute preteasibility analyses of selected market options
- Prioritize high-potential products for inclusion in system trials
- Model potential impact of markets on adoption of prototype systems (linked to #5, 7, 9, 10)
- Develop and publish reference and training materials, disseminate through PRODAR and other regional and institutional organizations

Expert systems for designing integrated, small-scale production, processing, and marketing enterprises

- Form local stakeholders committees in selected pilot regions (linked to #19).
- Characterize existing production, processing, and marketing systems
- Develop or adopt technical and managerial packages for existing agroindustries with market potential
- Identify processing technology for high-potential products.
- Design, fund, and execute pilot projects for the development and testing of production and processing technology under real market conditions.
- Incorporate technological and managerial innovations.
- Prepare feasibility analyses (technical, marketing, financial, and management aspects)
- Prepare plan for commercial operation and expansion or replication of enterprise.
- Generate an expert system to facilitate decision making based on experience gained.

Postharvest processing technology for selected products and agroecosystems

- Define criteria for selecting target agroecosystems and products (linked to #5, 7, 9, 10, 22)
- Review literature to identify sources of technology supply
- Evaluate suitability of existing technology for products selected.
- Identify partner institutions and prepare projects for development or adaptation of selected technology.
- Obtain funding and execute technology development projects in collaboration with rural development agencies in target agroecologies
- Publish and disseminate design and operating manuals

Guidelines for designing institutional structures to support small-scale agroindustries

- Identify and analyze cases of successful support to rural enterprise projects.
- Institute mechanism for communication between enterprise, development project and rural community in selected sites (linked to #10, 20)
- Create or strengthen support services, including:
  - * Assembly and basic postharvest handling infrastructure
  - * Financial services
  - * Market and price information
  - * Business and accounting expertise
  - * Technological information, etc
- Prepare and disseminate guidelines based on experience gained

New capacity to implement methodology

- Establish or strengthen training capacity in partner institutions (linked to #18)
- Conduct training and awareness activities with:
  - * Rural development planners and policy makers
  - * Rural development practitioners
  - * Food technologists and agricultural economists and engineers
- Provide follow-up support to specific projects at multiple sites.
- Extend application of methods through PRODAR and other international organizations

Project #13: Conservation of Genetic Resources of Beans, Cassava, and Tropical Forages for Sustainable Agriculture in Latin America, Africa, and Asia

Objectives: To meet international standards in the conservation of genetic resources that will satisfy the present and future needs of plant breeders and other germplasm users and to train national scientists in the conservation of plant genetic resources.

Outputs: Germplasm collections, managed according to FAO/IPGRI standards and safely duplicated and restored; characterization and evaluation of the germplasm for agronomic traits; core collections for efficient screening; and related sources of diversity identified.

Gains: Farmers throughout the tropics and subtropics will be using dozens of germplasm accessions, as such or after improvement. Sources of disease and pest resistance will be identified for germplasm enhancement and plant breeding. This will make production systems more sustainable by contributing to the conservation of agrobiodiversity and by reducing farmers' dependence on expensive and potentially harmful inputs.

Duration: 7 years

1997	Fully computerized system available for monitoring conservation, characterization, and distribution; protocols for multiplication of clean seed and facilities for conservation and characterization available.
1998	Improved in vitro technologies developed for vegetatively propagated germplasm; safety duplication and restoration initiated.
2001	Procedures developed for conservation of wild species, based on studies of seed biology and physiology; safety duplication and restoration continues.
2003	Technologies developed for cryopreservation; safety duplication and restoration completed; upgrading of gene bank completed.

Users: Plant breeding programs throughout the tropics and subtropics, extension services, and farmers associations. This work will also benefit universities in research and teaching.

Collaborators: Research—CORPOICA (Colombia), EMBRAPA (Brazil), INIFAP (Mexico), INIA (Peru), Colombian NGOs, USDA, IPGRI. Distribution, safety duplication, and restoration—CORPOICA (Colombia), EMBRAPA (Brazil), INIFAP (Mexico), INIA (Peru), INIA (Ecuador), CIP, CIMMYT, CATIE, IPGRI.

CG system linkages: Program 7 (80%), Program 1 (10%), Program 8 (5%), Program 9 (5%).

Project # 13: Conservation of Genetic Resources	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	296.3	-	305 2	-
Other Personnel	595.8	-	613.7	-
Operations	187.2	74.9	192 8	-
Research Services	34.4	-	35.4	-
Central Services	369.9	-	381.0	-
Total	**1,483.6**	**74.9**	**1,528.1**	**-**
Financing Plan				
Unrestricted Core	1,459.6	-	1,503.4	-
Restricted Core				
RF - Genetic Transformation of Rice	24.0	-	24 7	-
Non-agenda financing				
AGCD - Bichemical Basic Bean...	-	74.9	-	-
Total	**1,483.6**	**74.9**	**1,528.1**	**-**

Project #13: Conservation and Study of Genetic Resources of Beans, Cassava, and Tropical Forages for Sustainable Agriculture in Latin America, Africa, and Asia

Project Purpose

To meet international standards in the conservation of genetic resources that will satisfy the present and future needs of plant breeders and other germplasm users and to train national scientists in the conservation of plant genetic resources.

Outputs

Activities

Techniques for germplasm conservation

- Develop improved disease diagnostic procedures for safe germplasm introduction, multiplication, and distribution.
- Identify optimum conditions for maintenance of germplasm viability through research on physiological and clonal propagation.
- Develop effective procedures for:
  * Cryoconservation of meristems and seeds
  * In vitro conservation of *Manihot* and nonseeding grasses and legumes
- Develop and implement efficient computer-based system for germplasm management.
- Implement strategies/techniques for assessing genetic coverage, planning targeted collection, and monitoring genetic drift and contamination of conserved germplasm.

Safely conserved germplasm

- Conserve plant, rhizobia, and mycorrhizal germplasm under long-term conditions.
- Regenerate and multiply germplasm.
- Duplicate mandate collections for safety.
- Link ex situ conservation with development of strategies for in situ conservation.

Germplasm characterization

- Characterize conserved accessions for morphoagronomical traits and collaborate in evaluation for specific traits.
- Characterize conserved accessions at the biochemical and molecular levels to identify duplicates and determine stability.
- Develop well-defined core collections.

Information and germplasm available to partners

- Compile characterization and evaluation data in databases.
- Provide documentation through publications and the SINGER network.
- Distribute germplasm and restore national collections.

Training, capacity building, and public awareness

- Train CIAT and NARS staff in gene bank management and germplasm conservation (linked to #18).
- Network with other genetic resources centers and conservation agencies in the ecoregion and beyond (linked to #18).
- Develop public awareness products with IPGRI, NARS, NGOs, and media companies (linked to #18).

Project #14: Understanding Genetic Diversity for Improved Conservation and Use of Genetic Resources

Objective: To better understand the genetic and spatial relationships between genetic resources and their habitats, with a view to improving the conservation of genetic resources and promoting their use for sustainable agricultural development.

Outputs: Knowledge of the relationships among plant genetic resources (*Phaseolus*, *Manihot*, *Brachiaria*, *Stylosanthus*, *Arachis*, etc.) and their habitats for application to the conservation and utilization of germplasm in agricultural development.

Gains: Techniques for assessing genetic diversity will be adapted for target species and for the available infrastructure. Ecological, geographical, genomic, and agronomic descriptive data will be integrated. The occurrence of useful genetic diversity will be predicted and explored. A better understanding of gene pool structures will be achieved at the intra- and inter-specific and generic levels. Information and methodologies will be shared with partners.

Duration: 5 years

1997	Biotech and GIS techniques available for assessing genetic diversity.
1998	Molecular linkage maps and DNA-based markers available for assessing diversity; core collections developed for target species.
2000	Agroecological, genomic, and sociological information integrated and mapped for CIAT mandate crops as models for other species; training and other capacity-building activities organized for NARS.
2001	Information available on plant genetic diversity at the inter- and intraspecific and generic levels; linkage made between ex situ collections and in situ diversity and the relation established between this and the conservation and use of genetic resources.

Users: This work will better enable germplasm custodians and plant breeders to develop rational strategies for conserving, monitoring, and using genetic resources. Institutions located in the centers of diversity of target species (primarily in Latin America) will be gain most from the knowledge generated by this work, but programs in Asia and Africa will also profit from more readily available genes and gene complexes and from information about their potential uses.

Collaborators: Fundamental research—CORPOICA (Colombia), EMBRAPA (Brazil), ORSTOM, CSIRO, University of Hohenheim (Germany), Purdue and Cornell Universities (USA), CIMMYT, IRRI, IPGRI, CIP. Implementation and testing—CORPOICA, Instituto von Humboldt and Universidad de los Andes (Colombia), EMBRAPA (Brazil), INIFAP (Mexico), UNA/La Molina (Peru).

CG system linkages: Program 7 (75%), Program 1 (15%), Program 8 (5%), Program 9 (5%).

Project # 14: Understanding Genetic Diversity	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	278.7	53.2	287.1	-
Other Personnel	170.3	51.9	175.4	-
Operations	66.7	98.6	68.7	-
Research Services	47.2	-	48.6	-
Central Services	162.9	-	167.8	-
Total	**725.8**	**203.7**	**747.6**	-
Financing Plan				
Unrestricted Core	725.8	-	747.6	-
Non-agenda financing				
RF - Development Cassava Mapping	-	93.2	-	-
AGCD - Development of Bean Mapping	-	46.7	-	-
UNIVIENA - Bioch. and Genetic...	-	13.1	-	-
Italy - Transformation of Bean	-	33.0	-	-
BMZ/GTZ Improving Chilling Tolerance		17.7		
Total	**725.8**	**203.7**	**747.6**	-

Project #14: Understanding Genetic Diversity for Improved Conservation and Use of Genetic Resources

Project purpose

To better understanding the genetic and spatial relationships between genetic resources and their habitats, with a view to improving the conservation of genetic diversity and promoting its utilization for sustainable agricultural development.

Outputs

Activities

Techniques for assessing genetic diversity

- Adapt molecular techniques for CIAT target species.
- Develop easily accessed spatial data sets (GIS).
- Apply screening tools based on biochemical pathways.
- Build capability for statistical analyses of genetic diversity.
- Develop techniques for relating genetic and phenotypic traits to spatial data.
- Develop molecular linkage maps for CIAT mandate crops.

Integrated agroecological, genomic, and sociological information

- Produce maps relating geographical, genomic, and agronomic traits of target species and associated organisms.
- Use genome maps of CIAT species incorporating biochemical, molecular, and agronomic data for tagging genes of economic importance.
- Predict occurrence of useful genetic diversity of species (*Manihot*, *Phaseolus*, *Stylosanthes*, and *Arachis*) or species associations (linked to #13).
- Predict potential adaptation range of genotypes and species (*Manihot*, *Phaseolus*, *Stylosanthes*, and *Arachis*) (linked to #13).
- Assess variability of associated organisms (mites, *Xanthomonas*, etc.) across environmental and temporal gradients in CIAT agroecosystems.
- Generate and integrate data on agronomic traits and socioeconomic knowledge (*Manihot* and *Phaseolus*) (linked to #1, 2).

Knowledge of gene pool structures at the intra- and interspecific and generic levels

- Develop linkages to conservation strategies for CIAT mandate crops and agroecosystems (linked to #13).
- Develop core collections of target species (*Manihot*, *Phaseolus*, *Stylosanthes*, *Arachis*, and *Brachiaria*) (linked to #1, 2, 4, 13).
- Elucidate phylogeny of target species (*Manihot*, *Phaseolus*, and *Brachiaria*).
- Define structure of intraspecific variability (*Manihot*, *Phaseolus*, *Stylosanthes*, *Arachis*, and *Brachiaria*).
- Integrate genomic information (comparative mapping) within Euphorbiaceae, Leguminosae, and Gramineae.
- Study gene flow between wild and cultivated forms.

Information available to CIAT's partners

- Develop user-friendly interfaces for applying techniques to geographical databases.
- Contribute to and make available integrated genome databases by CD Rom and Internet.
- Train partners in the use of databases (linked to #18).
- Exchange information with partners.

Project #15: Broadening the Genetic Base of Cultivated Gene Pools

Objective: To identify and access exotic or novel genes and gene combinations to broaden the crop genetic base and contribute to germplasm enhancement.

Outputs: Exotic or novel genes and gene combinations identified and accessible to cultivated gene pools; improved methodologies for genetic transformation; knowledge about mechanisms of genetic variability in plant-stress response; improved methods for gene transfer; and plant stocks expressing useful genes for germplasm enhancement.

Gains: Improved methodologies will be available for exploiting the variability in wild species and for interspecific and alien gene transfer to enhance gene pools for quality traits and resistance. New knowledge will be developed about points of genetic intervention for crop improvement. Techniques for genetic transformation will be available for modification of quality and resistance characters. Information will be available on variability and stability of plant products with value for crop improvement.

Duration: 5 years

1997	Genes and gene combinations identified for gene pool enhancement; methodologies developed for gene transfer in *Phaseolus*, cassava, rice, and *Stylosanthes*.
1998	Factor in biotic resistance identified; genetic stocks available that express quality and resistance traits.
2000	NARS scientists trained.
20001	Characterized gene pools and genes available; enhanced gene pools available for testing and use.

Users: This work will add value to genetic resources by identifying useful variability and by generating knowledge on selected mechanisms of tolerance to biotic and abiotic stresses. In addition, linkages between the conservation of genetic resources and their use for germplasm enhancement will be strengthened through improved accessibility of genes and gene combinations and improved procedures for broadening the crop genetic base.

Collaborators: Fundamental research—EMBRAPA (Brazil), CORPOICA (Colombia), Scripps Research Institute at Cornell University (USA), Purdue and Ohio State Universities (USA), IRRI, CIMMYT, IITA, IPGRI. Testing of genetic stocks—ORSTOM; John Innes Institute (UK), University of Ghent (Belgium); University of Hannover (Germany). CSIRO, INIFAP (Mexico), CORPOICA (Colombia), EMBRAPA (Brazil), UNA/La Molina (Peru).

CG system linkages: Program 1 (60%), Program 7 (30%), Program 8 (5%), Program 9 (5%).

Project # 15: Broadening the Genetic Base	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	277.5	78.2	285.8	-
Other Personnel	226.9	47.6	233.7	-
Operations	142.1	57.0	146.4	25.0
Research Services	50.4	-	51.9	-
Central Services	222.7	-	229.4	-
Total	**919.6**	**182.8**	**947.2**	**25.0**
Financing Plan				
Unrestricted Core	919.6	-	947.2	-
Non-agenda financing				
IGER - Antinutritional Comp. of Forages	-	25.0	-	25.0
AGCD - Biochemical Basis Bean Weevil	-	157.8	-	-
Total	**919.6**	**182.8**	**947.2**	**25.0**

Project #15: Broadening the Genetic Base of Cultivated Gene Pools

Project purpose

To identify and access exotic or novel genes and gene combinations to broaden the crop genetic base and contribute to germplasm enhancement.

Outputs

Knowledge on exotic and novel genes and gene combinations

Knowledge on molecular-biochemical mechanisms of genetic variability in plant-stress responses and on points for genetic intervention

Plant stocks expressing useful genes for germplasm enhancement

Information and materials available to CIAT's partners

Activities

- Identify transgressive gene combinations from wide crosses within *Phaseolus* and *Oryza*, using molecular marker technology (linked to #1, 3).
- Identify and access the apomixis gene from *Brachiaria*, using molecular biology techniques, for gene tagging and cloning (linked to #4).
- Develop and characterize genetic stocks for enhanced use of genetic variability.

- Monitor diversity and stability of plant biomolecules and other metabolic products, using biochemical-molecular approaches (ß-carotene in cassava, intermediary metabolites in postharvest deterioration of cassava roots, and others) (linked to #1, 2).
- Characterize mechanisms of genetic variability and develop screening methods (resistance to bean weevil and to spittle bug in *Brachiaria* and tolerance to soil acidity).

- Improve gene transfer methods for cassava, beans, *Brachiaria*, and rice (linked to #1, 2, 3, 4).
- Produce interspecific hybrids within *Phaseolus* and *Oryza* through wide crossing, aided by embryo rescue and molecular markers (linked to #1, 3).
- Produce transgenic cassava stocks expressing genes for stem borer resistance, variability in starch quality and in cyanogenesis, and other traits (linked to #2).
- Produce transgenic rice stocks with resistance to RHBV and other traits, *Brachiaria* stocks with the apomixis gene, and *Stylosanthes* stocks with disease resistance (linked to #3, 4).

- Develop, document, and make available collections of genomic and cDNA clones, genes, gene constructs, plasmids, and other vectors and plant stocks containing and expressing novel genes.
- Make available information on biochemical-molecular factors involved in plant stress mechanisms and on possible points for genetic intervention.
- Train partners in methods and techniques for broadening crop genetic base (linked to #18)

Project #16: Identifying and Characterizing Tropical Grasses and Legumes for Multiple Uses

Objective: To investigate the potential of naturally occurring grasses, legumes, and microorganisms for their utility as feed, for soil improvement, or for pest and disease control in agroecosystems of the subhumid and humid tropics.

Outputs: New grass and legume ecotypes characterized for their climatic and edaphic adaptation, feed quality, and role in natural resource management; information on the potential utility of grasses and legumes for different ecoregions and production systems; an understanding of the nature and role of tannins in determining the feed value of tropical legumes; an understanding of the adaptive attributes of grasses and legumes under low soil fertility; and knowledge on the role of endophytes in reducing diseases and pests in grasses.

Gains: Improved availability of grass and legume ecotypes will reduce the time to utilization of wild species in natural resource management and for livestock feed. Identification of adaptive attributes will increase the efficiency of genetic enhancement. Definition of the nature of antiquality factors will facilitate selection and use for feed. Endophytes have potential for reducing the need to use chemical inputs for disease and pest control.

Duration: 5 years

1997	Coordination of tannin research by IARCs, AROs, and NARS reviewed and approved; genotype x environment interactions understood for *Desmodium ovalifolium*.
1998	Survey completed of presence of endophytes in tropical grasses; new ecotypes identified for dry season feed value; procedure available for evaluating tannin in legumes.
1999	Improved screening procedure developed for evaluating efficiency of nutrient acquisition; information system available on utility of grasses and legumes for multiple uses.
2000	Role of endophytes in tropical grasses known.

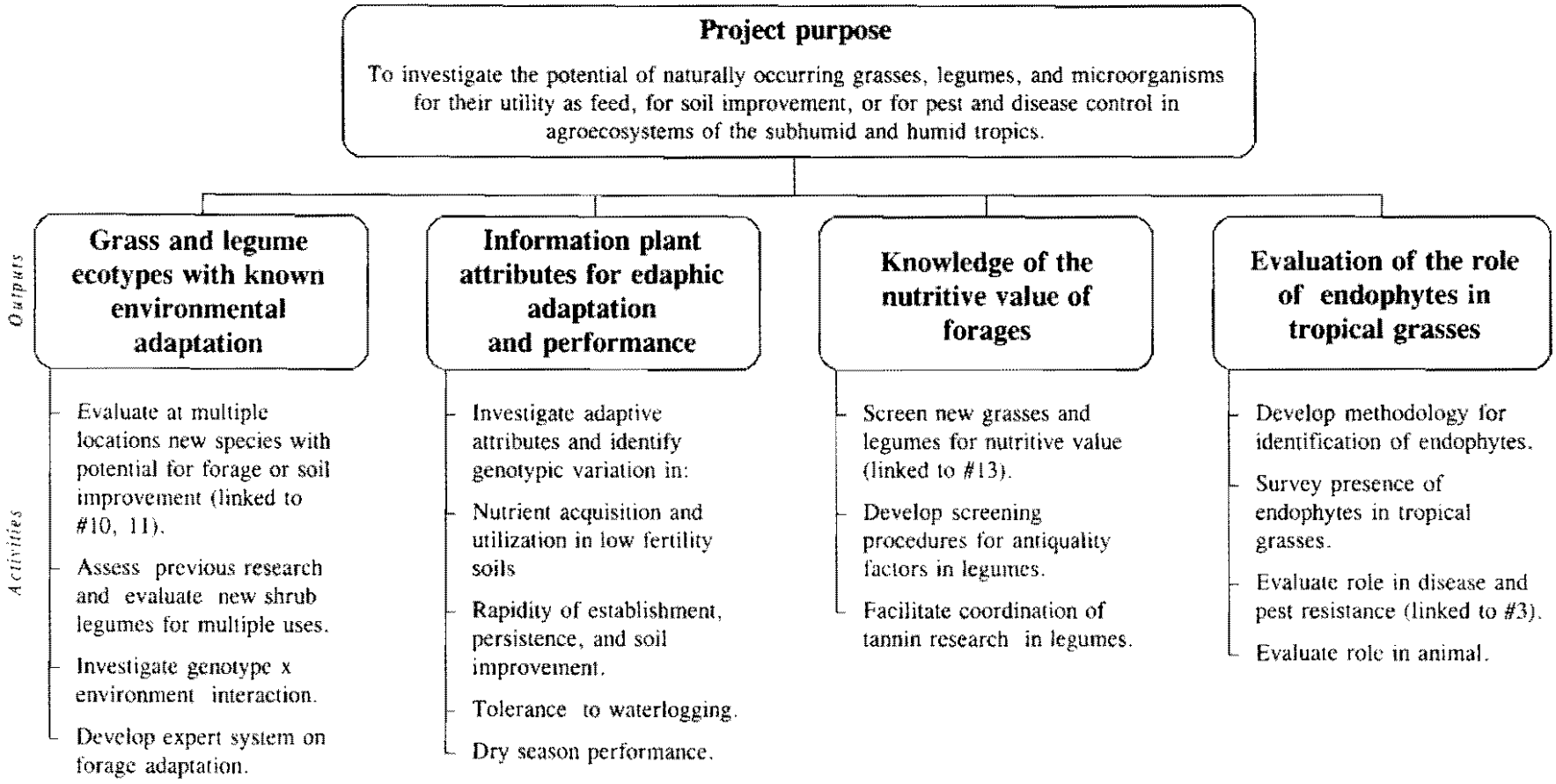
Users: Government, nongovernment, and farmer organizations throughout the subhumid and humid tropics that need additional grasses and legumes with the potential to improve the productivity and sustainability of agropastoral systems.

Collaborators: Evaluation for different end uses—RIEPT (Latin America), SEAFRAD (Asia), AFRNET (Africa). Studies of genotype x environment interaction—University of Hohenheim (Germany). Tannin research—IGER (UK), Massey University (New Zealand), ILRI, CORPOICA (Colombia). Work on edaphic adaptation—Hohenheim and University of Vienna (Austria).

CG system linkages: Program 7 (50%), Program 2 (30%), Program 3 (10%), Program 9 (10%), Program 12 (5%).

Project # 16: Tropical Grasses and Legumes for Multiple uses	WORKING BUDGET 1996 CGIAR Resarch Agenda	Special Projects	Estimated 1997 CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	233.7	75.5	240.6	77.8
Other Personnel	138.4	49.6	142.6	51.1
Operations	94.0	92.1	96.8	71.1
Research services	25.2	-	26.0	-
Central services	59.5	-	61.3	-
Total	**550.8**	**217.2**	**567.3**	**200.0**
Financing Plan				
Unrestricted Core	299.7	-	308.7	-
Restricted Core				
Colombia - Tropical Grasses	251.1	-	258.6	-
Non-agenda Financing				
Japan - Role of Endophytes	-	177.0	-	200.0
Various - Forage Seeds	-	40.2	-	-
Total	**550.8**	**217.2**	**567.3**	**200.0**

Project #16: Identifying and Characterizing Tropical Grasses and Legumes for Multiple Uses



Project #17: Assessment of the Past and Expected Impact of Research in Agriculture and Natural Resource Management

Objectives: To generate information that helps guide the allocation of CIAT resources, assists NARS in priority setting, improves the quality and efficiency of the Center's outputs, and indicates the returns to stakeholders' investments.

Outputs: Improved information and analysis, applicable to regional, national, and agroecosystem scales, for estimating the likely magnitude and distribution of the economic benefits of commodity and natural resource management research. In addition, appraisals of the acceptability, adoption, and impact of selected CIAT outputs.

Gains: Improved allocation of resources could increase the rate of return on investment in agricultural research by an additional 2%.

Duration: 3 years

1996	Data sets compiled; review of development trends in Latin America prepared; benefits of CIAT projects estimated; field studies on bean IPM and savanna changes conducted.
1997	Review on adoption and impact of CIAT outputs prepared; project monitoring procedures developed and tested; two field studies on technology adoption and acceptability conducted; paper written on methods of impact assessment for resource management issues.
1998	Project monitoring system linked to estimates of impact assessment; paper prepared on evaluation of nonmarketed research outputs; two field studies on technology adoption and acceptability conducted.

Users: The information derived from these models will help research planners in NARS and the CGIAR with decisions about resource allocation. Stakeholders in this research will have a way to measure expected returns to investment in agricultural and resource management research.

Collaborators: Field studies on technology adoption and acceptability—NARS in Latin America, Asia, and Africa. Methodology development and strengthening of NARS—IFPRI, IICA. Use of outputs—IDB, NARS in Latin America, Asia, and Africa.

CG system linkages: Program 8 (100%).

Project # 17: Impact Assessment	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	168.0	-	173.1	-
Other Personnel	130.0	-	133.9	-
Operations	77 0	-	79 3	-
Research Services	-	-	-	-
Central Services	43.4	-	44.7	-
Total	**418.4**	**-**	**431.0**	**-**
Financing Plan				
Unrestricted Core	368.4	-	379.5	-
Restricted Core				
IDB - Impact Assessment	50 0	-	51 5	-
Total	**418.4**	**-**	**431.0**	**-**

Project #17: Assessment of the Past and Expected Impact of Research in Agriculture and Natural Resource Management

Project purpose

To generate information that helps guide the allocation of CIAT resources, assists NARS in priority setting, improves the quality and efficiency of the Center's outputs, and indicates the returns to stakeholders' investments.

Outputs

Databases, methods, and operational guidelines to support improved assessment of the benefits of commodity-oriented and natural resource-oriented agricultural research

Estimates of the contribution of CIAT's expected outputs to economic growth, poverty alleviation, and sustainability of the natural resource base

Analysis of the acceptability, adoption, and impact of CIAT outputs

A system for conducting, monitoring, and evaluation as integral component of CIAT projects

Activities

- Compile and organize basic data sets, including but not limited to, research activities and costs, biophysical conditions, production systems, commodity markets, demography, and infrastructure.
- Review and revise existing aggregate models for assessing the economic benefits of research.
- Identify and adapt novel techniques for extending the economic analysis to include nonmarket outputs.

- Analyze current development trends to assess potential consequences for CIAT's research portfolio (linked to #1-22).
- Formulate research investment scenarios to estimate consequent magnitudes and patterns of expected benefits from CIAT outputs (linked to #1-22).

- Review literature on historic adoption and impact of CIAT outputs.
- Conduct field studies on acceptability and adoption of CIAT outputs (e.g., bean IPM in Colombia and crop/livestock changes in savannas) (linked to #5, 9, 21).

- Develop appropriate procedures for monitoring and evaluation (linked to #1-22).
- Assist project leaders in the use and implementation of the monitoring and evaluation system (linked to #1-22).
- Utilize information from project monitoring and evaluation system to improve projections of expected impact.

Project #18: Strengthening Private and Public Linkages for Agricultural Research and Development

Objective: To help increase the effectiveness of national, regional, and global agricultural research and development systems by building partnerships, sharing information, developing human resources, and promoting collaboration between countries and institutions.

Outputs: Local and regional consortia and networks that integrate the R&D plans of the private and public sector for selected commodities and agroecosystems; trained national program personnel; and global agricultural R&D networks for sharing information, prioritizing research issues, and promoting horizontal collaboration.

Gains: Information exchange, sharing of results, and research prioritization will lead to more effective and efficient use of the human and financial resources dedicated to agricultural R&D. Farmers, processors, and consumers will have better and quicker access to new knowledge, research tools and methodologies, and technology components.

Duration: 5 years

Pending arrival of the new director for regional cooperation; for partial milestones, refer to training, communications, and networking activities of CIAT's other projects.

Users: The direct beneficiaries include developing country institutions (both public and private) engaged in research and development related to CIAT's mandated responsibilities; international and regional organizations; developed country agencies that dedicate resources to basic and applied research and to technical cooperation in developing countries; and donors that finance bilateral and multilateral R&D activities.

Collaborators: Public and private sector institutions involved in agricultural R&D, principally in Latin America but also Asia and Africa, for consortium and network development and training and communication. AROs in both developed and developing countries. CIAT's donors. IARCs with activities in Latin America.

CG system linkages: Program 9 (50%), Program 10 (40%), Program 12 (10%).

Project # 18: Strengthening Private and Public Linkages	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	133.6	71.7	137.7	71 7
Other Personnel	242.4	19.8	249.7	19 8
Operations	767.0	481.9	790.0	225 5
Research Services	84 1	-	86.6	-
Central Services	98 1	-	101 0	-
Total	**1,325.2**	**573.4**	**1,365.0**	**317.0**
Financing Plan				
Unrestricted Core	1,216.7	-	1,253.2	-
Restricted Core				
Colombia - Linkages	68.5	-	70.6	-
IDB - Impact Assesment	40.0	-	41 2	-
Non-agenda financing				
AGCD - Cassava Biotechnology Network	-	314 1	-	284 0
IDB - Training in Agropastoral Systems	-	180.0	-	-
Colombia - Control Virus Passion Fruit	-	79.3	-	33.0
Total	**1,325.2**	**573.4**	**1,365.0**	**317.0**

Project #18: Strengthening Private and Public Linkages for Agricultural Research and Development

Project purpose

To help increase the effectiveness of national, regional and global agricultural research and development systems by building partnerships, sharing information, developing human resources and promoting collaboration between countries and institutions.

Outputs

Consolidated regional and global commodity-based R and D networks

Activities

Support the consolidation of CIAT's existing commodity-based networks:

* Bean in C. America, the Andean Region (Project #5) and East and Southern Africa (Project #6)
* Cassava in Latin America and Asia (Projects #2, #7)
* Forages in Latin America (RIEPT) and Asia (Project #9)
* Rice in Latin America (INGER-LAC)
* Cassava and Bean advanced research networks (CBN and BARN)

Interinstitutional consortia for the design and execution of R&D plans and projects for selected commodities, systemwide programs, and agroecosystems

Participate in the formation and consolidation of local or regional consortia, including:

* Hillsides (Central America, CIPASLA, CONDESAN) (Projects #19, #20)
* Tropical Lowlands (savannas, Alternatives to Slash and Burn)
* Latin America Rice Fund (FLAR) (Project #3)
* Managing Acid Soils Consortium (Project #11)

Information for agricultural scientists and agricultural and rural development practitioners

Provide partner R&D institutions in targeted countries with rapid access to current bibliographic information worldwide.

Trained agricultural and resource management scientists and enhanced regional capacity for technology transfer

Provide specialized training to experienced scientists in customized programs.

In collaboration with partner institutions, provide broadly based group training in resource management research.

Develop capacities of national and subregional programs to train technology intermediaries.

Project #19: Methods of Farmer Participation in Research and Gender Analysis for Technology Development

Objective: To develop, apply, and disseminate participatory methods and principles of organizational design, which improve feedback from end users of research to scientists at early stages in R&D and which promote low-cost, sustainable institutionalization of the approach by NARS.

Outputs: Widely applicable methods to involve users in the development of technology for crop production and natural resource management and to develop institutional models for conducting client-oriented research at the farm and landscape levels.

Gains: Users will be involved at early stages in decisions about technology design. Methods will be available for incorporating users' preferences. Participatory research will be applied on a routine basis in CIAT programs. At least three major universities in Latin America will have the capacity to teach participatory research methods, including gender analysis. At least 1,000 trainees and 40 trainers will be able to teach these methods in the region. Training materials and methodology will be published and widely disseminated. The contribution of participatory research to rates of technology adoption will be measured in a target area.

Duration: 5 years

1996	Courses offered on methods in at least six Latin American countries, with replication of CIAL institutional model.
1998	Methods introduced to NARS plant breeding, IPM, and research management research in at least six countries.
2001	At least 40 trainers prepared; gender-differentiated adoption impact assessed in economic terms; methods disseminated worldwide.

Users: This work will benefit poor rural men and women farmers, processors, traders, and consumers, especially in fragile environments. Researchers will receive more accurate and timely feedback from end-users about the acceptability of production technologies and conservation practices. Research and planner will profit from methods for conducting adaptive research and implementing policies on natural resource conservation at the micro level.

Collaborators: Regional training in at least four countries—Condesan, PROCIANDINO, NARS, NGOs, universities. National-level training with NARS in at least two other countries—Cornell University (USA), NORAGRIC, University of Guelph (Canada).

CG system linkages: Program 11 (70%), Program 9 (30%).

Project # 19: Methods of Farmer Participation	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	132.0	-	136.0	-
Other Personnel	153.0	98.3	157.6	98.3
Operations	140.0	142.5	144.2	125.7
Research Services	11.4	-	11.7	-
Central Services	12.2	-	12.6	-
Total	**448.6**	**240.8**	**462.1**	**224.0**
Financing Plan				
Unrestricted Core	248.6	-	256.1	-
Restricted Core				
IDB - Ecoregional Activities	200.0	-	206.0	-
Non-agenda financing				
Kellogg - Farmer Participation in Tech	-	240.8	-	224.0
Total	**448.6**	**240.8**	**462.1**	**224.0**

Project #19: Methods of Farmer Participation in Research and Gender Analysis for Technology Development

Project purpose

To develop, apply, and disseminate participatory methods and principles of organizational design, which improve feedback from end users of research to scientists at early stages in R&D and which promote low-cost, sustainable institutionalization of the approach by NARS.

Outputs

Assessment of prototype NRM technology for acceptability to farmers

Activities

- Link indigenous experimentation with formal research through regular innovator workshops with farmers and other watershed stakeholders on design of natural resource conservation practices.
- Evaluate with users the acceptability of component NRM technology and prototype production systems (input to #10).
- Conduct strategic research on methodology development for farmer participation in IPM systems (linked to IPM systemwide initiative).
- Develop methodology for participatory system trials at the landscape scale with groups of stakeholders.
- Derive farmers' criteria for acceptability of new components and systems.

Assessment of germplasm for acceptability to farmers, with participatory plant breeding

- Develop participatory plant breeding strategies and improve the quantitative analysis of farmer preference data.
- Provide methodological support and training for participatory evaluation of genetic resources, breeders' nurseries, segregating populations, and advanced lines (linked to #1, 2, 3, 4).
- Derive farmers' criteria for acceptability of new germplasm and ensure regular feedback from farmers to plant breeders.

New methodology and institutional models for participatory research in agriculture and NRM

- Select and test suitable methods for:
  - * Typologies of users or stakeholders differentiated by well-being (poverty) and gender
  - * Problem diagnosis goal setting by different types of users or stakeholders at landscape scale
  - * Local-level, participatory monitoring of sustainability indicators
  - * Conflict resolution (linked to #20 and ecoregional research).
- Conduct strategic sociological research on the impact of novel organizational models on social capital formation and technical innovation in agriculture and NRM; determine implications for participatory research (linked to #5, 6, 7, 8, 9, 10, 12).
- Develop data collection and analytic methods for linking participatory diagnosis, technology evaluation, and gender analysis to GIS databases to identify patterns across agroecosystems, types of technology, and user groups (linked to ecoregional research).
- Monitor and evaluate the evolution of the CIAT methodology, as this is disseminated to NARS in at least six countries through training; assess the costs benefits, and impact of CIALs.
- Publish results and develop training materials.

Improved capacity to conduct participatory research and gender analysis

- Convene international workshops and seminars on experience with PPR in different fields (linked to #18).
- Conduct or facilitate in-house training on participatory research methods and gender analysis for CIAT staff.
- Contribute to workshops, courses, and seminars of CIAT projects (linked to #18).
- Institutionalize capacity to teach the CIAL methodology with partner institutions (especially universities) in four focus sites by conducting courses, follow-up training, and training of at least 40 trainers.
- Feed results into development of public awareness materials (linked to #18)

Project #20: Community Management of Watershed Resources in Hillside Agroecosystems of Latin America

Objective: To develop decision-support systems and organizational models for local planning and technological innovation in community-led watershed management.

Outputs: Procedures to identify priority areas, problems, and beneficiary groups for community management of watershed resources; methodologies for incorporating stakeholders' values into scenarios for change; guidelines for defining the minimum data needed for decision support; methods to facilitate collective action by multistakeholder community organizations; models for using decision-support systems in participatory planning; a set of interactive decision-support tools.

Duration: 5 years

1997	Watershed-scale prototype interactive computer applications tested at a pilot site with stakeholder organizations; regional databases available to NARS collaborators.
1998	Prototype applications add multiple-scale mechanisms; models incorporate indigenous knowledge and market effects on adoption.
2000	Minimum data needs and process versus knowledge-based models assessed; prototype computer applications replicated and distributed to NARS.

Gains: In project study sites, there will be increased community action to sustain the productivity of the resource base. Communities will be better able to develop projects for funding. Farmers and communities will increase testing of innovative, value-adding activities. Socioeconomic and biophysical indicators of sustainability will show positive gains. Personnel will be trained in conflict resolution. Extrapolation and targeting of project research results will be improved through querying of publicly available databases and GIS.

Users: The primary beneficiaries are resource-poor farm families and communities in the Andean and Central American hillsides. Secondary beneficiaries are off-site stakeholders. Tertiary beneficiaries are national and international development organizations interested in priority setting.

Collaborators: Model development—University of Florida (USA), University of Wageningen (Netherlands), IFPRI. Database development—University of Berne (Switzerland). Cropping system data—CIMMYT. Land cover and land use change—CIP, IICA. Water management research—IIMI. Dissemination of results—PROCIANDINO. Field level studies—CIPASLA (Colombia), Hillsides Consortium in Central America, CONDESAN. Participatory research—CIAT's Farmer Participation Project, CIPASLA (Colombia); NGOs in Colombia, Honduras, and Nicaragua.

CG system linkages: Program 6 (60%), Program 8 (20%), Program 11 (20%).

Project # 20: Community Management of Watershed Resources	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	424.0	44.0	436.8	-
Other Personnel	108.0	-	111.2	-
Operations	491.0	4.0	505.7	-
Research Services	21.1	-	21.7	-
Central Services	51.1	-	52.7	-
Total	**1,095.2**	**48.0**	**1,128.1**	**-**
Financing Plan				
Unrestricted Core	560.2	-	577.0	-
Restricted Core				
SDC - Improving Agricultural Sustainab.	233.0	-	240.0	-
IDB - Ecoregional Activities	302.0	-	311.1	-
Non-agenda financing				
DANIDA - Postdoctoral Fellow	-	48.0	-	-
Total	**1,095.2**	**48.0**	**1,128.1**	**-**

Project #20: Community Management of Watershed Resources in Hillside Agroecosystems

Project Purpose

To develop decision-support systems and organizational models for local planning and technological innovation in community-led watershed management.

Outputs

Activities

Improved targeting and extrapolation of conservation technologies

- Consolidate data into user-friendly biophysical and socioeconomic databases with NARS (linked to #22).
- Develop a step-wise procedure for increasing the precision and resolution of spatial data.
- Characterize key indicators for hillside watersheds at plot, farm, catchment, and watershed scales.
- Define cause-effect mechanisms of land use change at plot, farm, catchment, and watershed scales.
- Define and characterize poverty levels of beneficiary and stakeholder groups in databases.
- Enter problem diagnosis and goal setting by different stakeholder groups in databases.
- Design procedures using databases to identify priority areas, problems, and beneficiary groups for intervention in watershed management.

Interactive decision-support systems tested with watershed stakeholder groups

- Link with stakeholder-based, watershed groups as a forum for evaluating prototype decision-support systems.
- Conduct participatory land use planning and technology testing at a landscape scale with communities (linked to #19).
- Identify indigenous environmental indicators and calibrate with scientific sustainability indicators (linked to #12).
- Develop field tools for local monitoring of indicators by different interest groups.
- Incorporate indigenous indicators into knowledge-based decision-support systems, and calibrate with GIS analysis.
- Conduct workshops to test and refine decision support in local planning.

A flexible set of interactive decision-support tools

- Model potential impact of new technology (linked to #11).
- Construct multiobjective bioeconomic models.
- Develop knowledge-based models.
- Value effects of deforestation on sedimentation and agrochemical pollution from different land uses.
- Evaluate interactive development of scenarios with stakeholders.
- Conduct cost/benefit analysis of decision-support models (linked to #17).
- Define minimum data needs and costs for modeling options.
- Compare results from process models built with "hard" data and from knowledge-based models built with subjective weights or decision rules.
- Derive scenarios for different technologies and land use systems

An institutional capacity to use decision-support systems for community management of watershed resources

- Develop organizational principles and procedures for watershed user associations and institutional consortia.
- Conduct action research with user participation on organizational development.
- Monitor and evaluate local planning with decision support scenarios.
- Process results into computer-assisted training materials.
- Disseminate information to NARS.
- Link to research networks (e.g., ICASA and commodity and NRM networks).

Project #21: Socioeconomic and Ecological Causes and Consequences of Land Use Change in the Latin American Savannas and Forest Margins

Objective: To analyze the socioeconomic and ecological consequences of land use change and derive technological and policy priorities through field research and GIS analysis.

Outputs: Characterization of changing land use patterns and causal factors and of plant community changes relative to land use; economic evaluation of biodiversity loss; quantification of trade-offs between land users' objectives and environmental protection; and profiles of required technological and policy interventions.

Gains: Diagnostic field studies and GIS analysis will give a demand-driven orientation to technology development. Technology adoption will increase. Policy makers and the world community will have quantitative evaluations of the trade-offs between production and environment.

Duration: 5 years

1997	Georeferenced socioeconomic and biophysical databases developed; dynamics of plant communities understood with reference to past and present land use.
1998	Adoption studies completed; valuation of some externalities completed.
2000	Scenarios of development paths developed for savannas and forest margins and tradeoffs defined between equity, conservation, and agricultural production.

Users: Researchers in the biological sciences, policy makers, and NGOs will obtain field-based feedback on technological and policy needs. Farmers in unfavorable environments will obtain technologies more suited to their conditions. The urban poor will get cheaper food, and in the long run society at large will benefit from reduced global warming and biodiversity losses.

Partners: Field research—EMBRAPA (Brazil), CORPOICA (Colombia). GIS—Universidad de los Andes (Colombia), University of Uberlandia (Brazil), Wageningen (Netherlands), University of Maryland (USA). Scenarios—IFPRI, ICRAF, Wageningen, Universidad de los Andes.

CG system linkages: Program 6 (70%), Program 8 (20%), Program 7 (10%).

Project # 21: Land Use Change in Savannas and Forest Margins	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	145.1	-	149.4	-
Other Personnel	100.0	29.8	103.0	29.8
Operations	63.0	33.5	64.9	30.2
Research Services	15.9	-	16.4	-
Central Services	65.2	-	67.2	-
Total	**389.2**	**63.3**	**400.9**	**60.0**
Financing Plan				
Unrestricted Core	389.2	-	400.9	-
Non-agenda financing				
France - Research Impr. Native Grass.	-	63.3	-	60.0
Total	**389.2**	**63.3**	**400.9**	**60.0**

Project #21: Socioeconomic and Ecological Causes and Consequences of Land Use Change in the Latin American Savannas and Forest Margins

Project purpose

To analyze the socioeconomic and ecological consequences of land use change and derive technological and policy priorities through field research and GIS analysis.

Outputs

Identification of land use change and causal factors

Quantitative information on socioeconomic and ecological consequences of land use change

Identification of demands, opportunities, and technological and policy priorities

Activities

- Survey land users in the Cerrados, Caqueta, and Pucallpa (linked to #10).
- Analyze satellite images and secondary data in the Cerrados and Pucalpa (linked to #22).
- Describe indigenous plant taxonomy and use in Pucalpa.

- Analyze impact of land use change on plant communities and pasture degradation in Acre-Rondônia, Pucalpa, and Colombian Llanos (linked to #9).
- Estimate bioeconomic models for the Cerrados, Caquetá, and Acre-Rondônia (linked to #10).
- Value biodiversity losses in the Colombian Llanos (linked to #17).

- Analyze adoption of grass and legume pastures, pasture recuperation, ley farming, no-till, and green manures in the Cerrados, Caquetá, and Pucalpa (linked to #17).
- Evaluate trials and new opportunities with farmer participation (linked to #19).
- Estimate ex-ante adoption models for new interventions in the Cerrados, Caquetá, and Colombian Llanos.
- Quantify tradeoffs between production and environment.

Project #22: Environmental sustainability and land use dynamics in Latin America

Objective: To support policy making by analyzing land use patterns under alternative policy scenarios, by generating indicators of land use sustainability, and by identifying major environmental opportunities and constraints for sustainable land management.

Outputs: Assessment of policy options for sustainable agroecosystem management; GIS digital maps and databases on land use, land degradation, environmental factors, population, and poverty at the local to regional scales; assessment of policies shaping land use; forecasts of land use patterns under alternative scenarios; indicators of sustainability at different scales; and assessment of alternatives for restoring degraded lands.

Gains: The degradation of agricultural land will decrease. Sustainable forms of land use will expand. Indicators of the sustainability of land management will be monitored and used to assess current and alternative practices. A better understanding of the dynamics of land use and its impacts will lead to more productive and sustainable land use systems.

Duration: 5 years

1997	CD produced with digital maps and databases of environmental constraints and opportunities, socioeconomic factors, population distribution, and poverty; ecological impact of agricultural land use assessed in selected cases and alternatives proposed.
1998	Indicators developed and documented; holistic framework developed and tested for understanding land dynamics; exploratory simulation model of land use at selected sites implemented and validated.
1999	Land use characterized at hillside, forest margin, and savanna sites.
2000	Alternatives for restoration of degraded land identified and assessed.
2001	Policy options assessed for sustainable management of agroecosystems.

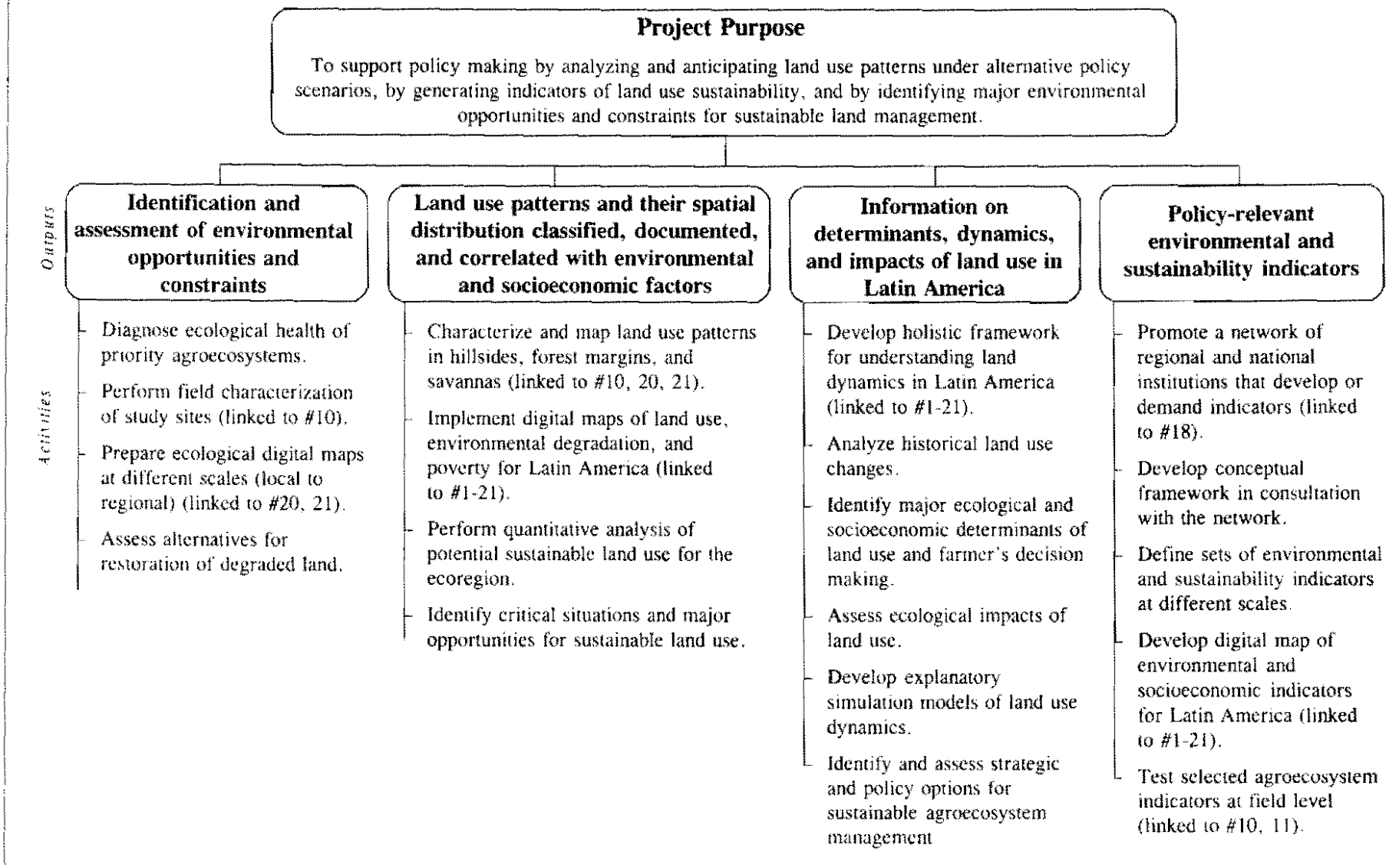
Users: One set of beneficiaries includes international, national, and local policy makers, development and planning agencies, and NGOs. Another includes agencies developing technology options. Improved policy making and technology design will improve the living conditions of the rural poor and increase the sustainability of land use.

Collaborators: Development of environmental and sustainability indicators—UNEP, UN Commission on Sustainable Development, ECLAC, International Union for the Conservation of Nature. Development of regional digital maps—World Resources Institute, World Conservation Monitoring Centre. Research on patterns and dynamics of land use—EMBRAPA (Brazil), CORPOICA (Colombia), INIA (Argentina), FONAIAP (Venezuela), developing country universities, Ministries of Agriculture and Environment, CIP, CIMMYT, ICRAF, IFPRI, IICA.

CG system linkages: Program 6 (80%), Program 8 (20%).

Project # 22: Environmental Sustainability and Land Use Dynamics	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	1996 US$000		1997 US$000	
Senior Staff	365.4	112.0	376.4	-
Other Personnel	278.0	60.0	286.3	-
Operations	203.4	91.0	209.5	44.0
Research Services	-	-	-	-
Central Services	125.5	-	129.3	-
Total	**972.3**	**263.0**	**1,001.5**	**44.0**
Financing Plan				
Unrestricted Core	750.9	-	773.5	-
Restricted Core				
IDB - Ecoregional Activities	221.4	-	228.0	-
Non-agenda financing				
BMZ/GTZ - Dynamics of Soil Organic...	-	30.0	-	11.0
CIP - Agricultural Resource Assessment	-	33.0	-	33.0
UNEP - Environmental & Sust. Indicators	-	200.0	-	-
Total	**972.3**	**263.0**	**1,001.5**	**44.0**

Project #22: Environmental sustainability and land use dynamics in Latin America



V. Research Support

This section outlines the minimum necessary infrastructure to support the research and development mandate of CIAT.

Training and Conferences

Training is an important mechanism for enabling scientists in R&D institutions in targeted countries to better perform their jobs. In connection with germplasm development, CIAT offers specialized training to experienced scientists in highly customized programs. This focused and labor-intensive approach to human capital development involves about one hundred trainees yearly.

CIAT has traditionally provided opportunities for training through research programs leading to higher degree theses (M.S. and Ph.D.). The number of higher degree trainees is expected to increase, whereas that for participants in introductory courses is being reduced.

Research must increasingly be a collaborative undertaking, involving multidisciplinary teams, consortia, networks, and other forms of interinstitutional cooperation. Through its training activities, CIAT supports interinstitutional efforts through partner identification, project design, and development of effective interinstitutional linkages.

The training budget includes resources for training personnel and operations ($90,000); scholarships (international travel, food and housing, stipends, local travel, and other direct costs related to the training participant) for nondegree trainees ($270,000); and scholarships for degree trainees ($80,000). In line with past experience, it is expected that, in addition to these core resources, substantial special project resources will be available for training scholarships.

Bringing people together in conferences and receiving visitors are two important mechanisms that link CIAT with partners and donors and with members of local and other communities. Conferences are an important part of strategic and operational planning, networking, exchange of scientific information, discussion of research issues, and linkages with the production sector. Visitors come to interact with CIAT staff and management and to obtain information about CIAT.

Specialized support for conferences includes maintenance and development of conference facilities, conference design, and preconference and conference logistics. Visitors are helped to plan their visits and during visits to make contacts with CIAT staff, find housing and transport, and ensure their well-being.

The conference budget includes resources for personnel and operations related to the conference infrastructure ($25,000). To organize and conduct conferences, $125,000 are set aside. Most conferences are financed from noncore resources.

Of the total core budget assigned to training and conferences ($1.005 million), $850,000 are allocated to Project #18 ("Strengthening Private and Public Linkages for Research and Development").

Research Services

The purpose of this area is to offer centralized research services (such as advanced equipment and facilities) for all CIAT projects and to provide machinery and irrigation for research and crop production at CIAT stations and at off-station experimental sites.

The services provided are as follows:

- Mass spectrophotometry and mycorrhizae laboratories and equipment and technical support for soil and plant analysis.
- Basic inputs for laboratory processes, such as specialized microscopic and microphotographic services of high quality, small animals, water of the necessary quality for chemical and microbiological processes, germplasm, inocula and evaluations pertinent to mycorrhizae and rhizobia, adequate sites for work with radioisotopes, and analyses of stable isotopes.
- Preventive and corrective maintenance for all equipment used in research.
- Space for common labs and provide plant growth facilities (screenhouses, greenhouses, growth rooms, and growth chambers).
- Storage and preparation of soils and provision of sheds, paved yards, and steam treatment.
- Technical consultancy on the design and climatic characterization of installations.
- Building and maintenance of roads, fencing, and irrigation and drainage structures and maintenance, repair, and operation of farm machinery.
- Management of commercial production of crops, seed plants, and cattle herd.

Information Systems

CIAT's Information Systems group plays a key role in managing the internal and external flow of data and in converting it to useful scientific information. Five departments or groups make up information systems: Communications, Information and Documentation, Geographic Information Systems, Applications and Database Programming, and Networking and Computer Systems.

The business of communications at CIAT is to help management and scientific staff project a positive image of the center to donors and partners. To do this job well requires close integration of the various activities that make up communications: namely, technical publication, public awareness, graphic design, photography, printing, and distribution and marketing. Consolidation of these resources and functions results in greater efficiency, quality, and consistency in CIAT's communications.

The Information and Documentation Unit provides two main outputs: namely, public services and technical processes. The products of public service are circulation and reference activities, information products, and orientation and training of library users. Questions are answered, databases searched, and bibliographies and pages of contents generated. Recent activities include the ability to access many overseas libraries via the INTERNET and to retrieve copies of foreign journal articles by fax from selected US and European libraries. A wide range of CD-ROMs are now accessible on-line over the network from a scientist's office. The technical processes group orders, acquires, and catalogs books and serials.

The geographical information systems (GIS) group in the Land Management Unit prepares and analyzes geographical data for a wide range of CIAT scientific staff, using the latest in GIS and image analysis software and hardware. The group can readily answer such questions as "how does access from an all-weather road affect rates of deforestation in Brazil" or "how does one design a decision-support system to examine alternative land use strategies and their impact on sustainability in different regions of Honduras." Country-wide and local-scale satellite image analysis is regularly carried out, and large scale, accurate three-dimensional orthophotomaps of Andean hillsides can also be produced. A CD of Latin American environmental and socioeconomic data will be published in 1996.

The application programming and database group carries out systems analysis and design for new computer applications, which programmers turn into new software systems. Statistical analysis of data is undertaken, and information from this and other sources is used to build CIAT-wide and strategic databases. User training and a help-desk keep computer users running efficiently, while a new technology group tests new hardware and software products for possible future adoption.

The networking and computer systems group keep mail and hardware systems, such as the SUN 2000 computer, Novell, and NT servers and networking equipment, running along with the associated systems software. More than 700 personal computers and their peripherals are self-maintained by CIAT as well as many work stations. CIAT still has one of the most advanced, up-to-date, high-speed, fiber-based networks in the CGIAR.

Financial Administration

The purpose of this area is to develop and maintain an integrated system for all of the Center's financial operations; provide the necessary tools for determining costs, developing and executing budgets, accounting for financial transactions, and financial reporting; and to plan for cash flow and manage surplus cash. The main activities of financial administration are to:

- Manage cash inflow and outflow and foreign exchange hedging operations, invest short-term surplus funds, and maintain relationships with commercial banks, financial institutions, and legal counsel.
- Coordinate the budget formulation and execution process, carry out cost analysis, and calculate reimbursable services rates.
- Manage accounting operations, including general accounting, accounts payable, accounts receivable, and fixed assets control.
- Prepare financial reports for management, the Board of Trustees, the CGIAR, external auditors, and donors.
- Coordinate financial matters with outposted stations.
- Oversee all automated financial systems and manual procedures, and introduce required changes.

Personnel Management/Administration

In the reorganization of services, all areas dealing with the management and administration of human resources have been brought together. Consequently, the newly created area of Personnel Management/Administration includes the management and administration of nationally recruited personnel, international staff, and training participants as well as payrolling services.

The purpose this area is to help ensure that the Center has the best suited personnel at all levels, to manage all administrative aspects of personnel, to plan and implement personnel development processes, and to help ensure that employment and workplace conditions are conducive to a well-motivated and effective work force at all levels.

Primary activities are:

- Contract personnel; develop and conduct induction programs, personnel evaluation systems, and promotion schemes; develop strategies to ensure good interpersonal working relationships; and design and develop recreational activities.

- Administer employment contracts, including salary and benefits administration.
- Administer institutional services provided to personnel.
- Ensure that personnel policies, norms, and regulations are applied, and provide relevant government and CGIAR agencies with required data and information.

Acquisition of Supplies and Services

The purpose of this area is to supply CIAT programs, units, projects, and other activities with materials, equipment, and services, both at headquarters and at substations in Colombia.

Main activities are:

- Make local purchases, import goods, contract services, store and control merchandise, and dispatch and deliver merchandise to users throughout the organization.
- Export seed samples and printed materials, tools, and equipment.
- Import and export household goods of international staff, manage and arrange office and warehouse space throughout CIAT, manage the Center's motor car fleet, and reassign and sell goods.
- Coordinate national and international mail services and provide messenger services within CIAT and from CIAT to Cali and Palmira.

Central Services

CIAT headquarters is located at Kilómetro 17 on the road between Cali and Palmira. The Center occupies 525 ha, of which 58,800 m^2 are occupied by buildings, while 26,000 m^2 comprise roads and parking areas. Because of the Center's distance from either city, it must provide most of the basic services, such as electricity, potable water, sewage treatment, telephone service, secure and comfortable on-campus housing for visitors and visiting researchers, food and catering services, transport for employees, industrial security, and first-aid facilities.

The Center maintains five additional stations in Colombia, located in different regions of the country, which also must be provided with similar services.

Because of the critical security situation in the host country—especially in the rural areas where CIAT works—it was necessary for CIAT to establish an internal security system capable of providing a minimum of security services to CIAT, its staff, and its assets.

In 1995, CIAT implemented a cost allocation scheme that allows for a meaningful allocation of the cost of Central Services to the various cost centers that make use of these services. This cost allocation is based on the actual volume of different services used.

Management

Management, as defined here, comprises the following elements:

- Board of Trustees
- Office of the director general
- Internal audit
- Office of the director of finance and administration
- Office of the executive administrator

Project Administration

As part of the structural adjustment plan, two former offices—the Project Development Office and the Special Projects Administration Office—were redesigned as follows:

A Donor Relations Office will be staffed by an internationally recruited professional. The purpose of this office will be to act as a liaison between CIAT and donor members of the CGIAR and donors outside the CGIAR. The head of the office will report to the director general and will closely coordinate activities with the offices of other directors, with the Impact Assessment Unit, and with technical personnel.

Given that a growing portion of the CIAT budget is classified as "restricted core," it is necessary to provide special administrative and reporting services to the research programs in general and to the offices of the research directors in particular. Practically all restricted core activities are subject to specific implementation and reporting requirements, which can best be managed through a Project Administration Office. This office, managed by a nationally recruited staff member, will report to a research director and will coordinate its activities with the respective research, financial, and administrative staff.

The cost of these two offices will not surpass the cost of the two former special project offices. See the summary budget in the accompanying table.

Non-Research Areas	Working Budget 1996		Estimated 1997	
	CGIAR Research Agenda	Special Projects	CGIAR Research Agenda	Special Projects
	Constant 1996 US$000		Constant 1996 US$000	
Research Support	1,723		1,723	
Training and Conferences	1,005		1,005	
Information Systems	1,872	152	1,872	82
Financial Administration	578		578	
Personnel Management/Administration	409		409	
Acquisition of Supplies and Services	267		267	
Central Services	2 630		2,630	
Management	1,611		1,611	
Project Administration	400		400	
Depreciation	1,600		1,600	
Total	**12,095**	**152**	**12,095**	**82**

Annex: Financial Tables

Table 1a: 1997 Center Agenda - Program & Project Operating Requirements (in thousands of US dollars).

	Center Programs										SWP/I			
	Increasing Productivity						Strengthening NARS							
Center Projects	Enhance & Breed	P. Syst. Dev. & M. Crops	Livestock	Protect Environ	Biodiver	Policy	Training	Info.	Org/ Mgmt	Network	Topical L.A. Program	Soils, Water, & N. Mgt.	Participatory Research	Total
	1	2	3	6	7	8	9	10	11	12	15	18	-	
Bean Yield Stability	1,179.1	208.1	-	-	-	-	-	-	-	-	-	-	-	1,387.2
Cassava Gene Pools	1,007.5	-	-	-	-	-	59.3	-	-	118.5	-	-	-	1,185.3
Rice Gene Pools	355.2	-	-	-	-	-	59.2	-	-	177.6	-	-	-	592.0
Enhancing Forage Grasses and Legumes	611.2	203.7	102.0	-	-	-	50.9	-	-	50.9	-	-	-	1,018.7
Bean Productivity in Latin America and the Caribbean	299.1	166.2	-	99.7	-	-	-	-	-	99.7	-	-	-	664.7
Bean Productivity in Sub-Saharan Africa	542.3	542.3	-	180.8	-	-	180.8	-	-	361.3	-	-	-	1,807.5
Integrated Cassava Crop Management	-	379.9	-	542.7	-	-	162.7	-	-	-	-	-	-	1,085.3
Integrated Rice Crop Management	220.5	-	-	294.0	-	-	147.0	-	-	73.6	-	-	-	735.1
Utilization of Tropical Grasses and Legumes	-	248.0	330.7	82.7	-	-	82.7	-	-	82.7	-	-	-	826.8
New Land Systems for Tropical America	-	316.5	63.2	759.5	-	-	-	-	-	126.6	-	-	-	1,265.8
Soil Quality and Environmental Impact	-	179.0	45.0	538.3	-	-	45.0	-	-	90.0	-	-	-	897.3
Rural Agroenterprises	-	103.2	-	172.0	-	-	34.4	-	-	34.4	-	-	-	344.0
Conservation of Genetic Resources	152.8	-	-	-	1,222.5	76.4	76.4	-	-	-	-	-	-	1,528.1
Understanding Genetic Diversity	112.1	-	-	-	560.7	37.4	37.4	-	-	-	-	-	-	747.6
Broadening the Genetic Base	568.3	-	-	-	284.1	47.4	47.4	-	-	-	-	-	-	947.2
Tropical Grasses and Legumes for Multiple uses	-	170.2	56.7	-	283.6	-	28.4	-	-	28.4	-	-	-	567.3
Impact Assessment	-	-	-	-	431.0	-	-	-	-	-	-	-	-	431.0
Strengthening Private and Public Linkages	-	-	-	-	-	-	682.5	546.0	-	136.5	-	-	-	1,365.0
Methods of Farmer Participation	-	-	-	-	-	-	78.6	-	183.5	-	-	-	-	262.1
Community Management of Watershed Resources	-	-	-	495.7	-	165.2	-	-	165.2	-	-	-	-	826.1
Land Use Change in Savannas and Forest Margins	-	-	-	280.6	40.1	80.2	-	-	-	-	-	-	-	400.9
Environmental Sustainability and Land Use Dynamics	-	-	-	662.8	-	165.7	-	-	-	-	-	-	-	828.5
Tropical Latin America Program	-	-	-	-	-	-	-	-	-	-	900.0	-	-	900.0
Soil Water, and Nutrient Management	-	-	-	-	-	-	-	-	-	-	-	1,000.0	-	1,000.0
Participatory Research	-	-	-	-	-	-	-	-	-	-	-	-	900.0	900.0
Overhead	2,059.7	1,043.0	247.6	1,853.4	1,151.9	272.2	751.5	223.0	223.9	570.7	355.5	-	-	8,751.5
Total Operating Requirements	**7,107.8**	**3,560.1**	**845.2**	**5,962.2**	**3,973.0**	**844.5**	**2,524.2**	**769.0**	**572.6**	**1,950.9**	**1,255.5**	**1,000.0**	**900.0**	**31,265.0**
less: Center Income														
Investment Income														500.0
Non-Agenda Project Overhead Recovery														300.0
Other Income														700.0
Total Center Income														1,500.0
Total Funding Requirements														29,765.0

Table 1b: 1997 Center Non-Agenda Projects (in thousands of US dollars).

Non-Agenda Projects	1997 Expenditure	of which, overhead component	Notes Why project is not part of the Center's research agenda
Bean chilling tolerance	54	9	Additional to current MTP 1994 -1998
Lowland rice gene pools	146	-	Bilateral project with Colombia
Strengthening collaborative bean research	578	62	Resources passed on to NARS
Comparison of alternative bean selection methods	15	-	Additional to current MTP 1994 -1998
Improved efficiency Phaseolus Vulgaris Rhizobium	108	12	Additional to current MTP 1994 -1998
Improving agricultural sustainability Asia	347	50	Additional to current MTP 1994 -1998
Farmer participatory research for soil improvement, Africa	56	-	Additional to current MTP 1994 -1998
Cassava biotechnology network	284	30	Additional to current MTP 1994 -1998
Improving small-scale cassava - starch extraction	57	-	Additional to current MTP 1994 -1998
Soil degradation and crop productivity research in Andean hillside farming	226	38	Additional to current MTP 1994 -1998
Role of endophytes	200	-	Additional to current MTP 1994 -1998
Pilot development for dual purpose cattle	126	20	Bilateral project with Colombia
G x E interaction Desmodium ovalifolium	43	-	Additional to current MTP 1994 -1998
Antinutritional components of tropical forages	25	-	Additional to current MTP 1994 -1998
Farmer participation in technology design and transfer - Phase III	224	39	Non CG donor
Bean improvement in Malawi	304	40	Bilateral project with Malawi
Integrating rice improvement within agropastoral systems	5	-	Additional to current MTP 1994 -1998
Upland rice gene pools	30	-	Additional to current MTP 1994 -1998
Research for improvement of native grassland	60	-	Additional to current MTP 1994 -1998
Improved dissemination of information	82	-	Non CG donor
Dynamics of soil organic matter	11	-	Additional to current MTP 1994 -1998
Agricultural resource assessment in the Andes	33	-	Additional to current MTP 1994 -1998
Identification of Maracuya viruses	33	-	Project off CG agenda
Cassava markets identification	35	-	Additional to current MTP 1994 -1998
Capital	371	-	Additional to current MTP 1994 -1998
Others	47	-	Additional to current MTP 1994 -1998
Non-Agenda totals	**3,500**	**300**	

Table 2: Center Research Agenda, by CGIAR Program, 1995-1997 (in thousands of US dollars).

		Actual 1995	Estimate 1996	Proposal 1997	Changes over 1996 estimate ($ '000)	Changes over 1996 estimate %
A. Center Programs						
Theme I	***Increasing Productivity***					
	Program Number/Title					
	1 Germplasm Enhancement & Breeding	7,530	7,450.3	7,107 8	(343)	(4.6)
	Production Systems Development & Mgmt:					
	2 Crops	5,964	3,771.2	3,560.1	(211)	(5.6)
	3 Livestock	1,954	895 4	845.2	(50)	-
	Total Increasing Productivity	**15,448**	**12,116.9**	**11,513.1**	**(603.8)**	**(5.0)**
Theme II	6 Protecting the Environment	**6,114**	**6,704.4**	**5,962.2**	**(742)**	**(11.1)**
Theme III	7 Saving Biodiversity	**3,450**	**4,165.1**	**3,973.0**	**(192)**	**(4.6)**
Theme IV	8 Improving Policies	**230**	**985.2**	**844.5**	**(141)**	**(14.3)**
Theme V	***Strengthening NARS***					
	9 Training	1,072	2,717.7	2,524 2	(194)	(7 1)
	10 Documentation, Publications, Information Dissemination	1,965	805.6	769 0	(37)	(4.5)
	11 Organization & Management Counselling	-	810 0	572 6	(237)	(29 3)
	12 Networks	1,611	2 065 3	1,950 9	(114)	(5.5)
	Total Strengthening NARS	**4,648**	**6,398.6**	**5,816.7**	**(581.9)**	**(9.1)**
Total Center Programs		**29,890**	**30,370.2**	**28,109.5**	**(2,261)**	**(7.4)**
B. Systemwide Programs / Initiatives						
	15 Tropical Latin America Program	300	54.8	1,255.5	1,201	2,191.1
	16 Alternatives to Slash and Burn	-	200.0	-	(200)	(100.0)
	18 Soil, Water, and Nutrient Management	-	775 0	1,000.0	225	29.0
	- Participatory Research	-	-	900.0	900	-
Total Systemwide Programs		**300**	**1,029.8**	**3,155.5**	**2,126**	**206.4**
Total All Center Activity		**30,190**	**31,400**	**31,265**	**(135)**	**(0.4)**

Table 3: Center Project Expenditures, by Program and Region, 1995-1997 (in thousands of US dollars).

	Actual 1995		Estimate 1996		Proposal 1997	
	Amount	CGIAR Program	Amount	CGIAR Program	Amount	CGIAR Program
Research Agenda						
Phaseolus Diversity	589	7	-		-	
Phaseolus Genetic Structure	1,233	2	-		-	
Sustaining Bean Productivity in Latin America and the Caribbean	741	1	-		-	
Sustaining Bean Productivity Sub Sahara Africa	2,164	1	-		-	
Coordination	124	1	-		-	
Conservation and characterization of Manihot	163	7	-		-	
Defining Desirable Characteristics of Cassava	376	2	-		-	
Germ Dev. for the Semiarid Tropics	646	1	-		-	
Germ Dev. for the subhumid tropics	129	1	-		-	
Germ Dev. for the Humid Tropics	181	1	-		-	
Germ Dev. for the Highlands	94	1	-		-	
Germ Dev. for the Subtropics	91	1	-		-	
Integrated Pest and Disease Management	340	2	-		-	
Integrated Cassava Crop Management	717	2	-		-	
Cassava Product Processing, and Market Development	256	2	-		-	
Research Planning, Information Exch. and Networking	425	12	-		-	
Improved Lowland Rice Gene Pools	360	1	-		-	
Information and Technology Sharing	413	12	-		-	
Improved Upland Rice Gene Pools	459	1	-		-	
Durable Blast Resistance	372	1	-		-	
Rice Traits to Enhance Weed Control	180	2	-		-	
Diversified Tagosodes/Hoja Blanca Resistance	127	1	-		-	
Integrated Rice Crop Management	99	2	-		-	
Enhanced Genetic Resources of Tropical Forages	487	7	-		-	
Genetic Enhancement of Brachiana	421	3	-		-	
Improved Forage Arachis Gene Pools	289	7	-		-	
Stylosanthes Cultivars with Anthracnose Resistance	244	1	-		-	
Forage Ecotypes with High Feed Quality	270	3	-		-	
Adaptive Attributes of Forages to Acid Soils	220	2	-		-	
Forage Components with Known Performance	796	3	-		-	
Institutional Support and Skill Acquisition	119	12	-		-	
Cropping System - Llanos	253	6	-		-	
Cropping System - Brazilian Cerrados	127	6	-		-	
Cropping System - Forest Margins	279	6	-		-	
A Mechanistic Understanding - Llanos	720	6	-		-	
A Mechanistic Understanding - Cerrados	202	6	-		-	
Dynamic of Land Use	293	6	-		-	
Coordination	208	6	-		-	
Effects of Soil Degradation and Practices of Soil Conservation .	220	6	-		-	
Decision Support System for Land Use Planning	133	6	-		-	
Prototype Systems for Ecologically Sound Intensification	162	6	-		-	
Central America			-		-	
Improving Agricultural Sustainability	843	6	-		-	
Hillsides	126	6	-		-	
Participatory research			-		-	
Improving Agricultural Sustainability .	20	6	-		-	
Construction of Molecular Map of Cassava	174	7	-		-	
Biochemical Basis of Bean Weevil	223	2	-		-	
Embryo Culture and Molecular Markers	317	2	-		-	
Genetic Interaction between Phaseolus vulgaris L ...	474	2	-		-	
Control of Plant Viruses Affecting	105	2	-		-	
Genetic Resources	924	7	-		-	
Maintenance of the GIS Facility	459	6	-		-	
Background GIS/Database Activities	26	6	-		-	
CIAT Climate Database for the Tropical World	373	6	-			
Diagnostic Surveys and Research Planning	410	6	-		-	
Ex ante Analysis of Returns to Research	175	8	-		-	
Institutional Linkages	269	12	-		-	
Training and Conferences	816	9	-		-	

Table 3: Center Project Expenditures, by Program and Region, 1995-1997 (in thousands of Us dollars).

	Actual 1995		Estimate 1996		Proposal 1997	
	Amount	CGIAR Program	Amount	CGIAR Program	Amount	CGIAR Program
Information and documentation	657	10	-		-	
Publications	386	10	-		-	
Business Development	453	10	-		-	
Bean Yield Stability	-		1,346.8	1-2	1,387.2	1-2
Cassava Gene Pools	-		1,150.8	1-9-12	1,185.3	1-9-12
Rice Gene Pools	-		574.8	1-9-12	592.0	1-9-12
Enhancing Forage Grasses and Legumes	-		989.0	1-2-3-9-12	1,018.7	1-2-3-9-12
Bean Productivity in Latin America and the Caribbean	-		645.3	1-2-6-12	664.7	1-2-6-12
Bean Productivity in Sub-Saharan Africa	-		1,754.9	1-2-6-9-12	1,807.5	1-2-6-9-12
Integrated Cassava Crop Management	-		1,053.7	2-6-9	1,085.3	2-6-9
Integrated Rice Crop Management	-		713.7	1-6-9-12	735.1	1-6-9-12
Utilization of Tropical Grasses and Legumes	-		802.7	2-3-6-9-12	826.8	2-3-6-9-12
New Land Systems for Tropical America	-		1,228.9	2-3-6-12	1,265.8	2-3-6-12
Soil Quality and Environmental Impact	-		1,056.6	2-3-6-9-12	897.3	2-3-6-9-12
Rural Agroenterprises	-		334.0	2-6-9-12	344.0	2-6-9-12
Conservation of Genetic Resources	-		1,483.6	1-7-8-9	1,528.1	1-7-8-9
Understanding Genetic Diversity	-		725.8	1-7-8-9	747.6	1-7-8-9
Broadening the Genetic Base	-		919.6	1-7-8-9	947.2	1-7-8-9
Tropical Grasses and Legumes for Multiple uses	-		550.8	2-3-7-9-12	567.3	2-3-7-9-12
Impact Assessment	-		418.4	7	431.0	7
Strengthening Private and Public Linkages	-		1,324.2	9-10-12	1,365.0	9-10-12
Methods of Farmer Participation	-		448.6	9-11	262.1	9-11
Community Management of Watershed Resources	-		1,095.2	6-8-11	826.1	6-8-11
Land Use Change in Savannas and Forest Margins	-		389.2	6-7-8	400.9	6-7-8
Environmental Sustainability and Land Use Dynamics	-		972.3	6-8	828.5	6-8
Alternatives to Slash and Burn	-		200.0	16	-	16
Soil, Water, and Nutrient Management	265		775.0	18	1,000.0	18
Tropical Latin America Program	35		34.0	15	900.0	15
Participatory Research					900.0	
Research Support/Management and Administration	7,138		10,412.1		8,751.4	
Total Research Agenda	**30,190**		**31,400**		**31,265**	
Regional Expenditure, Total Research Agenda	**($ '000)**	**%**	**($ '000)**	**%**	**($ '000)**	**%**
Asia	1,433	4.80	3,658	11.80	3,829	12.20
Latin America and Caribbean (LAC)	22,168	74.40	22,443	70.80	21,481	68.70
Sub-Saharan Africa (SSA)	6,196	20.80	5,060	15.40	5,450	17.50
West Asia and North Africa (WANA)	-	-	239	0.10	505	1.60
			31,400		31,265	
1						
Non-Agenda Projects						
Develop IPM Systems for Small Bean Farmers, in Andean Region	69		83		-	
Bean Improvement in Malawi	319		308		304	
Bean in Eastern Africa	-		578		578	
Improvement of Bean Production in the Central America and Caribbean Region - Phase III	73		14		-	
Bean Research Network for the Andean Zone of South America (PROFRIZA)	334		-		-	
Comparison of Alternative Selection Methods for Improvement	10		15		26	
Competition and Survival . .	8		-		-	
Genetics and Biochemistry of Bean Seed Protein ...	8		4		-	
Improved Efficiency *Phaseolus Vulgaris*	11		51		108	
Seeds of Hope	246		292		-	
Effect of Phosphorous Availablity on the Efficency	4		-		-	
Bean East Africa Program	37		-		-	
Bean chilling improvement	26		26		54	
Farmer participatory research to improve soils	-		56		56	
Capital, Africa	193		-		-	

Table 3: Center Project Expenditures, by Program and Region, 1995-1997 (in thousands of US dollars).

	Actual 1995		Estimate 1996		Proposal 1997	
	Amount	CGIAR Program	Amount	CGIAR Program	Amount	CGIAR Program
Cassava biotechnology network	374		284		284	
Control of cassava pest Cyrtomenus bergi	62		31		-	
Development of cassava molecular map	76		89		-	
Improving small-scale cassava - starch extraction	23		-		57	
Development of cassava germplasm for drier tropics	26		-		-	
Production marketing in cassava	8		-		-	
Investigation of metabolites implementation	6		-		-	
Field testing of improved cassava flour production process technologies	12		-		-	
Soil degradation and crop productivity research in Andean hillside farming	119		220		226	
Modernization and strengthening of the cassava agroindustry in the Atlantic Coast of Colombia	115		-		-	
Improving agricultural sustainability ..	329		-		-	
Regional cooperation in agriculture .	64		46		-	
Adding value to products ...	24		-		-	
Genetic diversity of cassava	-		20		-	
Cassava utilization	21		21		-	
Capital	40		4		-	
Activities CIRAD SAR	50		30		-	
Improve lowland rice gene pools	-		146		146	
Integrating rice improvement within agropastoral systems	26		20		5	
Silicon fertilization: an alternative to fungicides for disease management	3		-		-	
Anther culture training for Latin America	48		-		-	
INGER rice evaluation	62		120		-	
Upland rice gene pools	-		-		30	
Development of Stylosanthes cultivars	19		21		-	
Legume selectivity by grazing animals	21		-		-	
G x E Interaction Desmodium ovalifolium	24		94		43	
Role of endophytes	-		177		200	
Pilot development for dual purpose cattle	62		129		126	
Preservation of wild species Arachis in South America	350		-		-	
Antinutritionals components of tropical forages	7		25		25	
Soils indicator in sustainable agropastoral systems	5		93		-	
Effect of improved pastoral system on P dynamics	28		-		-	
Training project in research and development	316		180		-	
Research for improvement of native grassland	84		56		60	
Alternatives to Slash and Burn	102		-		-	
Dynamics of soil organic matter	-		-		11	
Agroforestry	163		-		-	
Postdoctoral fellow - Hillsides Program	69		46	289	-	
Sustainable hillside agriculture (Latin America)	173		-		-	
Farmer participation in technology design and transfer - Phase III	174		241		224	
Environmental and sustainability indicators	89		230		-	
Strategies for sustainable agriculture	-		-		384	
Construction of a molecular map of Phaseolus	123		89		-	
Rice biotechnology research	27		-		-	
Improving chilling tolerance in Phaseolus	21		-		-	
Cassava genome mapping	23		-		-	
Genetic manipulation of bean	11		-		-	
Cucumber mosaic virus	23		-		-	
Controlling viruses of maracuya	-		79		-	
The impact of public intervention	24		-		-	
Transfer of agricultural technology	59		-		-	
Ecoregional activities in Latin America	21		-		-	
Establishing a network on agriculture	-		152		82	

Table 3: Center Project Expenditures, by Program and Region, 1995-1997 (in thousands of US dollars).

	Actual 1995		Estimate 1996		Proposal 1997	
	Amount	CGIAR Program	Amount	CGIAR Program	Amount	CGIAR Program
Cassava market identification	-		-		35	
Agricultural resource assessment in the Andes	-		-		33	
Others	83		258		403	
Total Non-Agenda	**4,917**		**4,400**		**3,500**	
Regional Expenditure, Total Non-Agenda	**($ '000)**	**%**	**($ '000)**	**%**	**($ '000)**	**%**
Asia	218	4 50	193	4.40	199	5 70
Latin America and Caribbean (LAC)	3,680	74 80	2,745	62 40	2,283	65.20
Sub-Saharan Africa (SSA)	1,019	20 70	1,462	33 20	1,018	29 10

Note These are approved projects only; CIAT expects that in the course of 1996/1997 an additional amount of some US$400,000 in non-agenda projects will be identified

Table 4a. Research Agenda Operating Requirements, by Cost Center, 1995-1997 (in thousands of US dollars).

	Actual 1995	Estimate 1996	1997 Budget request	Changes over 1996 estimate $'000	%
Operations					
Research					
Beans	4,851	4,039	3,987	(52)	(1.0)
Cassava	3,418	2,814	2,765	(49)	(2.0)
Rice	2,010	1,606	1,585	(21)	(1.0)
Tropical Forages	2,846	2,508	2,476	(32)	(1.0)
Hillsides	1,304	1,328	1,311	(17)	(1.0)
Tropical Lowlands	2,082	1,620	1,600	(20)	(1.0)
Biotechnology	714	822	812	(10)	(1.0)
Virology	579	645	637	(9)	(1.0)
Genetic Resources	924	1,076	1,062	(14)	(1.0)
Land Management	1,268	1,353	1,336	(17)	(1.0)
Impact Assessment	175	502	495	(7)	(1.0)
Farmer Participatory	-	67	62	(5)	(8.0)
Enterprise Development	-	259	247	(12)	(5.0)
Strategic Research Initiatives	45	200	206	6	3.0
Scientific Resources Groups	128	92	95	3	3.0
Total research	**20,344**	**18,931**	**18,675**	**(256)**	**(1.0)**
Research Support					
Research services	176	407	386	(21)	(5.0)
Field operations	802	759	720	(39)	(5.0)
Information management	2,255	2,398	2,275	(123)	(5.0)
Biometry support	-	-	-	-	-
Visiting scientists and postdoctorals	95	386	367	(19)	(5.0)
Research management	548	453	430	(24)	(5.0)
Total research support	**3,876**	**4,403**	**4,178**	**(225)**	**(5.0)**
Institutional Development Support					
Linkages	269	315	299	(16)	(5.0)
Training and conferences	816	841	798	(43)	(5.0)
Total Institutional Development	**1,085**	**1,156**	**1,097**	**(59)**	**(5.0)**
Management and administration					
Board of Trustees	320	269	255	(14)	(5.0)
Central administration	2,692	2,898	2,750	(148)	(5.0)
Central services	1,258	1,743	1,520	(222)	(13.0)
EPMR	315	-	-	-	-
Total management and administration	**4,585**	**4,910**	**4,526**	**(384)**	**(8.0)**
Systemwide programs	300	2,000	2,789	789	39.0
Subtotal operations	**30,190**	**31,400**	**31,265**	**(135)**	**-**
Surplus (Deficit)	(1,999)	(400)	500	900	(225.0)
Total operations requirements	**28,191**	**31,000**	**31,765**	**765**	**2.0**
Self-generated income					
Investments	300	500	500	-	-
Complementary cost recovery	906	300	300	-	-
Other	-	700	700	-	-
Total self-generated income	**1,206**	**1,500**	**1,500**	**-**	**-**
Total funding requirements	**26,985**	**29,500**	**30,265**	**765**	**3.0**

Table 4b. Non-Agenda Operating Requirements, by Cost Center, 1995-1997 (in thousands of US dollars).

	Actual 1995	Estimate 1996	1997 Budget request	Changes over 1996 estimate	
				$'000	%
Operations					
Research					
Beans	1,070	1,528	1,125	(403)	(26)
Cassava	1,247	685	949	264	39
Rice	158	212	181	(31)	(15)
Tropical Forages	487	499	431	(68)	(14)
Hillsides	412	48	224	176	367
Tropical Lowlands	696	300	71	(229)	(76)
Biotechnology	241	308	-	(308)	(100)
Virology	17	79	33	(46)	(58)
Genetic Resources	-	50	-	(50)	(100)
Land Management	46	263	33	(230)	(87)
Impact Assessment	24	-	-	-	-
Farmer Participatory	-	241	-	(241)	(100)
Enterprise Development	-	35	-	(35)	(100)
Total research	**4,398**	**4,248**	**3,047**	**(1,201)**	**(28)**
Institutional Development Support					
Training and conferences	78	-	-	-	-
Information and documentation	2	152	82	(70)	(46)
Total Institutional Development	**80**	**152**	**82**	**(70)**	**(46)**
Total operations	**4,478**	**4,400**	**3,129**	**(1,271)**	**(29)**
Capital	439	-	371	371	-
Total operating requirements	**4,917**	**4,400**	**3,500**	**(900)**	**(20)**

Table 5. Summary of Costs by object of expenditures, 1995 - 1997 (in thousands of US dollars).

Expenses by category	Actual 1995	Estimate 1996	1997 budget request	Changes over 1996 estimate $'000	Changes over 1996 estimate %
Research Agenda					
Personnel	19,831	21,223	21,015	208	1
Supplies and services	6,300	7,342	7,550	(208)	(3)
Operational travel	1,891	1,235	1,100	135	11
Depreciation expense	2,168	1,600	1,600	-	-
Contingency	-	-	-	-	-
Total Research Agenda	**30,190**	**31,400**	**31,265**	**135**	**-**
Non-research Agenda					
Personnel	2,508	2,464	1,736	728	30
Supplies and services	1,426	1,408	980	428	30
Operational travel	544	528	413	115	22
Contingency	-	-	-	-	-
Subtotal	**4,478**	**4,400**	**3,129**	**1,271**	**29**
Capital	439	-	371	(371)	-
Additional operating funds	-	-	-	-	-
Total Non-research Agenda	**4,917**	**4,400**	**3,500**	**900**	**20**

Table 6: Capital Buget, 1995 - 1997 (in thousands of US dollars).

	Asset Acquisition Cost					
	Actual 1995		Estimate 1996		Proposal 1997	
	Research Agenda	Non-Agenda	Research Agenda	Non-Agenda	Research Agenda	Non-Agenda
A. Physical Facilities						
Research	279	-	150	-	80	-
Training	-	-	-	-	-	-
Administration	99	-	43	-	60	-
Housing	13	-	7	-	-	-
Auxiliary Units	-	-	-	-	-	-
Subtotal	**391**	**-**	**200**	**-**	**140**	**-**
B. Infrastructure and Leasehold	**93**	**90**	**100**	**-**	**130**	**50**
C. Furnishing and Equipment						
Heavy duty equipment	135	-	100	-	80	-
Laboratory and scientific	486	40	300	-	250	50
Office equipment and others	515	32	200	-	150	40
Computers	813	106	400	-	450	150
Vehicles	1,259	171	300	-	400	81
Aircraft	-	-	-	-		
Subtotal	**3,208**	**349**	**1,300**	**-**	**1,330**	**321**
Total capital expenditures	**3,692**	**439**	**1,600**	**-**	**1,600**	**371**
	Asset Financing and Capital Fund Reconciliation					
I. Sources of Asset Financing						
Capital Fund	3,761		500		900	
II. Capital Fund Reconciliation						
Balance, January 1	2,358		69		500	
Depreciation charge	2,175		1,600		1,600	
Disposal gains/losses	466		400		350	
Transferred from other funds	761		31		-	
Transferred to operating fund	(1,999)		-		-	
Subtotal	**3,761**		**2,100**		**2,450**	
Uses (Acquisitions)	3,692		1,600		1,600	
Balance, December 31	**69**		**500**		**850**	

Table 7. Staffing Pattern: Approved Positions for 1995, 1996, and Estimated 1997.

	Actual 1995		Estimate 1996		1997 Budget request		Changes over 1996 estimate	
	Center hired	Other hired	Center hired	Other hired	Center hired	Other hired	No.	%
Research Agenda:								
I. International staff positions			*	*	*			
Research	66	6					-	
Research support	1	-					-	
Institution building	5	-					-	
Management and administration	4	-					-	
Total	76	6	-	-	-	-	-	
II. Post-Doctoral Fellows	6	-					-	
III. Supervisory staff	254	-				-	-	
IV. Support Staff	729.75	-				-	-	
Total Research Agenda	1,065.75	6	-	-	-	-	-	
Non-agenda:								
I. International staff positions			*	*	*	*		
Research	4	-					-	
Research support	-	-					-	
Institution building	-	-					-	
Management and administration	-	-					-	
Total	4	-	-	-	-	-	-	
II. Post-Doctoral Fellows	5	-					-	
III. Supervisory staff	25	-					-	
IV. Support Staff	41.25	-					-	
Total Non-agenda	75.25	-	-	-	-	-	-	
Grand Total	1,141	6	-	-	-	-	-	#DIV/0!

* Positions are shown for the full year, although for budgetary purposes a fill ratio of 96 % is assumed.

Table 8a: Donor funding for Research Agenda Projects, 1997 (in thousands of current US dollars).

Donor	Australia	Belgium	Canada	Colombia	China	EEC	Ford Found	France	Germany	IDB	Japan	Nether-lands	Norway	Rockef. Found	Sasakawa Found	Spain	Sweden	Switzer	United Kingdom	UNDP	USAID	World Bank	Unrestricted funding: Total funding	Unrestricted funding: Center income	
Unrestricted Funding	339	164	989	-	10	2,439	400	206	608	-	3,600	-	433	-	-	80	304	1,474	692	-	3,050	11,469	26,249	1,500	
Research Agenda Projects	Donors' Restricted Funding to Projects ($ '000)																						Total Restr. Funding	Allocation: unrest. pool	Project total
Bean Yield Stability																							-	1,387.2	1,387.2
Cassava Gene Pools																							-	1,185.3	1,185.3
Rice Gene Pools				35										100									135	457.0	592.0
Enhancing Forage Grasses and Legumes				255																			255	763.7	1,018.7
Bean Productivity in Latin America and the Caribbean																							-	664.7	664.7
Bean Productivity in Sub-Saharan Africa			800															446			305		1,551	256.5	1,807.5
Integrated Cassava Crop Management															309					409			718	367.3	1,085.3
Integrated Rice Crop Management				90										26									116	619.1	735.1
Utilization of Tropical Grasses and Legumes	339			50																			389	437.8	826.8
New Land Systems for Tropical America				51						175								173					399	866.8	1,265.8
Soil Quality and Environmental Impact										200								199					399	498.3	897.3
Rural Agroenterprises																							-	344.0	344.0
Conservation of Genetic Resources																							-	1,528.1	1,528.1
Understanding Genetic Diversity																							-	747.6	747.6
Broadening the Genetic Base														24									24	923.2	947.2
Tropical Grasses and Legumes for Multiple uses				251																			251	316.3	567.3
Impact Assessment										50													50	381.0	431.0
Strengthening Private and Public Linkages				68						40													108	1,257.0	1,365.0
Methods of Farmer Participation																							-	262.1	262.1
Community Management of Watershed Resources										30								28					58	768.1	826.1
Land Use Change in Savannas and Forest Margins																							-	400.9	400.9
Environmental Sustainability and Land Use Dynamics										48													48	780.5	828.5
Tropical Latin America Program				191						407								302					900	-	900.0
Soil, Water, and Nutrient Management																								1,000.0	1,000.0
Participatory Research																								900.0	900.0
Overhead																								8,751.5	8,751.5
Member totals	339	-	800	991	-	-	-	-	-	950	-	-	-	150	309	-	-	1,148	-	409	305	-	5,401	25,864	31,265
																							Total received from donors		31,650

Table 8b: Donor funding for Non-Agenda and Systemwide/Ecoregional Initiatives, 1997 (in thousands of current US dollars).

Donor	Belgium	BMZ/ GTZ	Colombi	DANIDA	IDB	IDRC	Iran	Italy	Kellog. Found.	France	NRI	ODA	Nether- lands	Rockef. Found.	Switzer- land	Sasak. Found.	USDA	USAID	Various	Project total
Complementary projects	Restricted Funding to Projects ($ '000)																			
Bean chilling improvement							54													54
Comparison of alternative selection methods ..																			15	15
Strengthening collaborative bean research ...																			578	578
Improved Efficiency of Phaseolus Vulgaris										108										108
Lowland rice improvement			146																	146
Improving agricultural sustainability ..																347				347
Farmer participatory research														56						56
Cassava biotechnology network													284							284
Improving small-scale cassava - starch extraction										57										57
Soil degradation and crop productivity research in Andean hillside farming		226																		226
Role of endophytes																			200	200
Pilot development for dual purpuse cattle ...																			126	126
G x E Interaction Desmodium ovalifolium ...		43																		43
Antinutritional components of tropical forages ...																			25	25
Farmer participation in technology design and transfer - Phase III									224											224
Bean improvement in Malawi												304								304
Integrating rice improvement within agropastoral systems												5								5
Upland rice gene pools										30										30
Research to improve native grassland										60										60
Improved dissemination of information									82											82
Dynamics of soil organic matter ...		11																		11
Agricultural resource assessment the Andes																			33	33
Identification of Maracuya viruses																			33	33
Cassava market identification																			35	35
Capital																			371	371
Others																			90	47
	-	280	146	-	-	-	54	-	306	255	-	309	284	56	-	347	-	-	1,506	3,500

Table 9: Cash Requirements and Timing of Revenue Inflow 1995 - 1997 (in thousands of US dollars and percentages).

	Actual 1995		Estimate 1996		Budget Request 1997	
USES: Operations and Capital Acquisitions	Amount	% annual	Amount	% annual	Amount	% annual
Cash requirements for 3 months ended March	9,313	23.7	9,592	27.5	9,650	25.3
Cash requirements for 3 months ended June	11,636		9,346		9,783	
Cash requirements - Cumulative (6 months)	20,949	53.4	18,938	54.3	19,433	51.0
Cash requirements for 3 months ended September	9,526		8,346		8,865	
Cash requirements - Cumulative (9 months)	30,475	77.7	27,284	78.2	28,298	74.3
Cash requirements for 3 months ended December	8,763		7,605		9,782	
Cash requirements - Cumulative (12 months)	39,238	100.0	34,889	100.0	38,080	100.0
SOURCES: Center Reserves & Donor Funding						
Cash & cash equivalents on hand at January 1	13,997		7,486		6,300	
Grant income for 3 months ended March	7,420	22.7	8,752	26.0	9,260	23.9
Grant income for 3 months ended June	8,450		7,983		9,845	
Grant income - Cumulative (6 months)	15,870	48.5	16,735	49.7	19,105	49.3
Grant income for 3 months ended September	8,705		8,450		10,150	
Grant income - Cumulative (9 months)	24,575	75.1	25,185	74.7	29,255	75.4
Grant income for 3 months ended December	8,152		8,518		9,525	
Grant income - Cumulative (12 months)	32,727	100.0	33,703	100.0	38,780	100.0
MEMO NOTE Cash & equivalents on hand Dec.	7,486		6,300		7,000	

Funding as Percentage of Cash Requirements	**1994**	**1995**	**1996**
For 3 months ended March	79.7%	91.2%	96.0%
For 6 months ended June	75.8%	88.4%	98.3%
For 9 months ended September	80.6%	92.3%	103.4%
For 12 months ended December	83.4%	96.6%	101.8%

Table 10. Currency Expenditure Shares, 1995 - 1997 (% of total expenditures).

	Actual 1995	Estimate 1996	Projection for 1997
Currency			
US Dollar	40%	40%	40%
Colombian peso	60%	60%	60%
Total	**100%**	**100%**	**100%**

Table 11. Statement of Financial Position, 1995 - 1997 (in thousands of US dollars).

	Actual 1995	Estimate 1996	Projection for 1997
Assets			
Cash and bank balances	7,486	6,300	7,000
Accounts receivable			
Donors	4,459	4,800	4,900
Employees	216	300	350
Other	1,951	1,500	1,300
Inventories	1,461	1,600	1,500
Other current assets	1,285	1,112	1,300
Total current assets	**16,858**	**15,612**	**16,350**
Fixed assets			
Property, plant, and equipment	39,462	40,222	40,822
Less: accumulated depreciation	17,733	18,863	19,863
Total fixed assets	**21,729**	**21,359**	**20,959**
Total assets	**38,587**	**36,971**	**37,309**
Liabilities and fund balances			
Liabilities			
Bank indebtedness	955	1,200	800
Accounts payable			
Donors	5,819	4,600	4,400
Employees	849	750	800
Others	3,345	3,000	2,800
In-trust accounts	19	100	200
Accruals and provisions	756	800	950
Staff reserves	2,084	2,100	2,488
Total liabilities	**13,827**	**12,550**	**12,438**
Fund balances			
Capital invested in fixed assets			
Core	15,827	15,157	14,386
Complementary	5,902	6,202	6,573
Capital fund	69	500	850
Operating fund	2,962	2,562	3,062
Total fund balances	**24,760**	**24,421**	**24,871**
Total liabilities and fund balances	**38,587**	**36,971**	**37,309**