



CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

C I A T

~~Program~~ Plans and Funding Requirements 1989-1993

FUNDING REQUEST FOR 1991

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APPENDIX

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I INTRODUCTION

In 1988, the CGIAR approved CIAT's medium-term plan entitled "CIAT Program Plans and Funding Requirements 1989-1993 ". This plan was accepted by the CGIAR with the expectation that in the early stages of the five-year plan, CIAT would present its strategic plan to reach the year 2000. The strategic plan, in turn, would give rise to a new medium-term plan which would be initiated no later than the 1992 financial year. CIAT plans to discuss a new version of its strategic plan with TAC in March 1991 and subsequently present a new medium-term plan for the period 1992-1996. In the meantime, the 1991 funding request is still based on the CGIAR-approved 1989-1993 medium-term plan for CIAT.

In 1989--the first year of the medium-term plan--CIAT introduced a series of economies in its operations that enabled the Center to execute its full Essential Program at about \$630,000 below the approved budget. CIAT incorporated these reductions into its 1990 funding request, as well as into subsequent requests. For the 1990 budget year, CIAT's funding request, fully based on the approved medium-term plan, amounted to \$31,316,000 for essential activities. Because of a shortfall in available funding, actual funding against this request was \$28,916,000, i.e., a shortfall of \$2,400,000. This required the implementation of a series of programmatic reductions, temporary reductions in research and administrative support, the nonimplementation of the earlier approved cassava agronomy/breeding position for the development of a cassava germplasm pool for the semi-arid regions of Brazil and Africa, and the postponement of earlier approved senior staff positions (one position approved for 1989 and three for 1990).

The 1991 funding request for essential activities amounts to \$32,672,000. This request reflects variations from the 1990 budget base as shown in Table B (pages 23-24).

The reader will note that this 1991 request is lower than the original 1991 request (\$33,184,785) as approved in the mid-term plan. (In addition, it should be considered that the present funding request includes some \$500,000 for a building project and an addition to working capital, i.e., two earlier approved items that needed to be postponed in 1989 and 1990 because of budget underfunding in those years.)

CIAT wishes to point out that with available funding at the presently requested level, it will be able to carry out the essential work program for 1991 as presented in the mid-term plan.

II PROGRAM AND BUDGET DISCUSSION

Mandate and Objectives

CIAT works mainly with national agricultural research systems (NARS) to develop improved agricultural technology which will increase the quality and quantity of specific basic food commodities in the tropics, primarily in Latin America and the Caribbean. Within the CGIAR system, CIAT has global responsibilities for common beans and cassava, principal responsibility for tropical pastures, with specific responsibility for the acid, infertile soils of the American tropics, and regional responsibility for rice in the American tropics.

One of the primary purposes of the Center is to assist NARS in the development of plant varieties that produce relatively high yields with reduced levels of fertilizers and agricultural chemicals. Research emphasizes plant improvement in order to obtain a stable genetic resistance to major tropical pests and diseases, tolerance to adverse climate and soil conditions, and the development of technology to increase the sustainable production and utilization of the crops within its mandate.

The Board of Trustees

CIAT is governed by an independent Board of Trustees. The 1990-91 membership of the Board follows:

Name	Nationality	Name	Nationality
Fred Hutchinson (Chairman)	USA	Michel Petit	French
William Carlson	USA	Gabriel Rosas	Colombian
Richard Flavell	British	Juan Jose Salazar	Colombian
Leopold Gahamanyi	Rwandan	Jack Tanner	Canadian
Chukichi Kaneda	Japanese	Helio Tollini	Brazilian
Gabriel Montes	Colombian	Rodrigo Tarte	Panamanian
Ricardo Mosquera	Colombian	Lucia de Vaccaro	Peruvian
Josef Noesberger	Swiss	Armando Samper	Colombian
Gustavo Nores	Argentinian	(Chairman Emeritus)	

Organizational Structure

CIAT is comprised of three divisions. Research Division I consists of the Bean and Cassava Programs and the Biotechnology, Virology, and Genetic Resources support units. Also included are Station Operations and Research Services (with the exception of Data Services). Research Division II consists of the Rice and Tropical Pastures Programs, the Training and Communications Support Program, the Seed Unit, Data Services, and the Agroecological Studies Unit. Finance and Administration is the third division, responsible for general services and financial administration.

Research Sites

CIAT headquarters is a 521-hectare experiment station near Cali in Valle del Cauca, Colombia. There are four principal substations within the country where further work is carried out. Santander de Quilichao is a 184-hectare station located 60 km south of Cali and characterized by acid, infertile soils. Popayan is a 72-hectare station 150 km south of Cali and of intermediate altitude. Both Santander and Popayan stations are on land made available by FES, a private Colombian educational foundation. Santa Rosa is a 31-hectare station made available for CIAT's use by the Rice Growers Federation (FEDEARROZ) and located near Villavicencio in the piedmont of the eastern slope of the Andes. The largest station is Carimagua, a 22,000-hectare research site located in the heart of the Colombian Llanos and co-managed by CIAT with the Colombian national program, ICA. Cooperative agreements are maintained with various national and regional institutions to help carry out regional and international testing activities, in some cases with CIAT staff outposted there for research and support of commodity networks.

Program Achievements and Strategies

1 Bean Program

Achievements

- Improved varieties have been released and widely adopted in many regions. For example, in the major bean-producing regions of coastal Mexico, 40% of the farmers were using improved varieties. In Nicaragua, such varieties are sown on over 15,000 hectares. CIAT germplasm has also been widely released in Burundi, Ethiopia, Rwanda, and Zaire.
- Breeding for increased nitrogen (N) fixation has been a major area of study. Consistent yield increases due to Rhizobium inoculation have been observed in on-farm trials in Central America and Africa. Earliness in nodulation is a character which had not been screened for previously. The Program thus developed a screening method for its evaluation and tested a large number of genotypes. Several small-seeded genotypes have shown consistently better early nodulation than the best previously identified genotypes.
- The main line of research on drought adaptation mechanisms concerns drought avoidance through greater root growth or efficiency of water uptake. Studies undertaken recently have shown that root genotype is responsible for conferring adaptation to drought stress.
- Charcoal rot (Macrophomina phaseolina) is a serious soil-borne pathogen in dry, high-temperature regions of Latin

America and Africa The Program identified 22 resistant accessions and 15 intermediates under both field and greenhouse screening of large numbers of accessions It also found a high correlation between resistant accessions and drought tolerance, suggesting useful possibilities for screening as both problems tend to occur together

- The Program has carried out selection for resistance to bean pod weevil (Apion godmani) in bush and climbing lines and has selected several lines with good agronomic characteristics, adaptation, and seed color, which are undergoing further testing
- A total of 1688 accessions were recently evaluated for bean common mosaic virus (BCMV) Out of the 327 wild Phaseolus vulgaris accessions tested, three were resistant to BCMV, indicating the presence of the dominant I gene Roughly 200 accessions exhibited superior adaptation or resistance traits to bean geminiviruses Seven basic sources of bean golden mosaic virus (BGMV) tolerance/resistance were identified and will serve to introduce additional variability into bean varieties with BGMV tolerance
- The Program studied the mechanical inoculation of beans with BGMV, as compared with natural field infection, in Guatemala Although field evaluations are the preferred method for routine screening of segregating populations, mechanical inoculation in glasshouse conditions provides richer information on genotype response and is useful for the selection of parents A number of previously unknown plant responses related to BGMV resistance were identified
- The transfer of traits through interspecific crosses (e g , P vulgaris X P acutifolius) is proceeding and a number of hybrid plants have been recovered through embryo culture The Program has also successfully regenerated plants from callus cultures of several wild relatives of P vulgaris and cell suspension cultures of P acutifolius

Strategies

A. Reduce losses from pests and diseases

- Broaden the genetic base of resistance sources, including increased use of genes from wild ancestors and other cultivated Phaseolus species
- Identify resistance sources where lacking and incorporate the genes conditioning resistance into acceptable cultivars

- Develop integrated pest control strategies to complement genetic resistance while reducing pesticide applications

B. Improve efficiency of nutrient and water use

- Breed genotypes with improved ability to fix N
- Identify mechanisms and develop efficient screening methods for tolerance to low phosphorus and acid soils
- Generate genotypes with improved adaptation to water stress
- Stimulate NARS research in fertility management

C Increase yield potential of beans

- Emphasize selection for yield and exploit variation across gene pools to increase yield potential
- Modify growth habits of medium- to large-seeded grain types to increase yield potential
- Identify yield-maximizing optima for physiological traits such as canopy morphology and patterns of N uptake and partitioning

D Improve methods for utilizing genetic resources

- Study patterns of genetic diversity to prioritize genetic resource acquisition
- Utilize biochemical markers to increase breeding efficiency
- Evaluate the potential for increased utilization of wild ancestors and related species for genetic improvement
- Apply new methods for gene transfer
- Link biotechnology research institutes in developed countries to problems in the tropics through an advanced research network

Emphases in 1991

The Bean Program will give increased attention this year to studies of root systems. It will assess in detail relations among root characteristics--including root morphology and plant performance in drought or low-fertility conditions. Simultaneously, it will initiate studies on relations between root diseases and plant performance under drought stress, with emphasis on Macrophomina

Lines with resistance to the storage weevil (Zabrotes spp) will move into wholesale international distribution This kind of resistance has been transferred from wild Phaseolus vulgaris into agronomically acceptable cultivated types in a wide variety of grain types that will be made available to national programs, principally for use as parental material in national crossing programs

In Central America, national programs will assume responsibility for functions heretofore handled by CIAT, as CIAT reduces staff outposted in the region National programs will take over the multiplication and distribution of seed for regional nurseries, as well as the analysis and publication of data

2 Cassava Program

Achievements

- The impact of the integrated cassava projects in Colombia and Ecuador is becoming evident as significant numbers of farmers are benefiting from the increased price stability resulting from the use of cassava as an animal feed Both cassava production and rural employment have increased, leading to more stable and lower consumer prices for fresh cassava Consumer benefits in Barranquilla--northern Colombia's largest city--are estimated to be US\$3-4 million per year
- Strengthened Asian NARS are releasing improved varieties based on CIAT germplasm in Thailand, Indonesia, the Philippines, Malaysia, and China In Malaysia, one new variety offers the possibility of cropping previously unexploited peat soils, and yields of 14 t/ha of dry roots have been harvested after only six months
- Recent work on drought tolerance indicates that the crop is a C_3 - C_4 intermediate in its photosynthetic pathway, opening the possibility of creating new, higher yielding lines in the future A strong relationship has been shown between leaf photosynthetic rate and yield
- The cassava hornworm (Erinnyis ello) is one of the most serious pests of cassava grown in the tropics, at times resulting in complete defoliation leading to reduced root yield Some field populations of hornworm larvae were found to be infested with a virus causing considerable larval mortality A simple concentrate derived from the diseased larvae can be applied to the crop and has been shown to offer nearly complete control This method has been field-tested and farmer-adopted in numerous areas
- Chronic cyanide toxicity is a severe problem in Africa during drought in areas where cassava may be the only

available food after other crops fail Under such conditions, cyanide levels are normally higher than usual Preliminary screening has revealed lines which maintain low cyanide levels even under drought conditions

- The task of combining high yield potential with good eating quality had been elusive Currently, however, on-farm trials have resulted in varieties which meet both of these qualifications
- An advanced cassava research network has been established to undertake research in selected areas where presently there is a major constraint to improving production, processing, or utilization
- The in vitro cassava germplasm bank has been augmented to over 4000 entries, representing 90% of the global collection Nearly 200 elite clones were distributed to 17 countries Collections submitted to CIAT have been pathogen-tested and returned to their country of origin A comprehensive system for the management of the in vitro collection has been developed as a pilot project with the International Board for Plant Genetic Resources (IBPGR)
- A CIAT Breeder/Physiologist has been stationed at the International Institute of Tropical Agriculture (IITA) to facilitate collaboration between the two centers, with particular emphasis in the area of germplasm movement from Latin America to Africa A first shipment of 90,000 seeds took place in January 1990
- Root rots are becoming an increasing problem as cassava production systems become more intensified Research on control is based on combining improved cultural practices and varietal resistance Use of the production systems that have been developed has given excellent results In the Amazon wetlands, where severe losses have been reported, fourfold increases in yields have been attained Similar results are being obtained on Colombia's Atlantic coast
- The Cassava Program has used isozyme electrophoresis to characterize over 1400 clones in the germplasm bank as part of a systematic effort to identify duplicates in the collection

Strategies

- A Augment and characterize the germplasm collection for more effective utilization
- Molecular-fingerprint and map the genome

- Develop more efficient screening and genetic transformation techniques, especially for pest and disease resistance, physiological traits, and quality factors
 - Apply dihaploid techniques to uncover rare recessive genes
- B** Develop and offer production systems for sustainable and improved production in different agroecosystems
- Improve the knowledge of complex interactions of physical and biological environments with plant growth and development
 - Develop germplasm tolerant to biotic and abiotic stresses, especially drought
 - Design appropriate crop and pest management practices for target ecosystems
 - Design production systems based on botanical seed
 - Maintain biodiversity within the target ecosystems
- C** Improve the quality of cassava products for human consumption and animal feed
- Determine plant growth factors that affect the quality of starch and other root constituents
 - Develop processing techniques that will improve the quality of cassava flour and other products
 - Define starch and other root and leaf constituent properties required for various processing techniques and end uses
 - Develop acyanogenic varieties
- D** Facilitate the movement and adoption of new production and postharvest technologies to stabilize and increase the production of high-quality roots and leaves
- Utilize applied social sciences to ensure proper analysis and feedback of acceptability and value of technologies
 - Define market opportunities for cassava-based products
 - Promote rural development efforts based on the integration of production, processing, and marketing

Emphases in 1991

During 1991, the Cassava Program will continue to emphasize management of the world germplasm collection, the genetic improvement of numerous traits of interest to national programs, and breeding methodology development. New activities include the definition of a core collection for more efficient evaluations of genetic diversity. The Program will expand the wild species collection and will initiate studies on propagation techniques, agronomic characterization, and crossability among species.

The Program will study mechanisms underlying cassava tolerance to water stress and low phosphorus soils. Basic research on cassava photosynthesis will utilize carbon isotopes to study genotype reactions. The Program will emphasize soil fertility management systems and related cultural practices for improving productivity on sandy, poor soils (characteristic of major cassava-producing areas), and varietal response to fertilizer. Germplasm will be identified for drought-prone regions such as sub-Saharan Africa and northeast Brazil. The Program will intensify research on soil erosion in cassava-based systems and will emphasize studies on prominent cropping systems to maintain agroecosystem biodiversity, especially on the Colombian north coast.

Cytological studies will be used to characterize viruses and virus-like diseases of cassava, results of which will facilitate germplasm exchange. The Program will conduct field and vector transmission research with whiteflies and other arthropods. It will give greater emphasis to cassava American latent and cassava vein mosaic viruses. Field trials to determine yield losses from cassava Colombian symptomless virus (CCSpV) will be carried out, and molecular characterization of potex viruses will be initiated, eventually leading to genetically engineered cassava for virus resistance.

The Program will study preharvest root rot problems in northern and northeast Brazil to define management systems for control. It will emphasize resistance studies on fungal stem and root rot pathogens and mycoplasma-induced "witches'-broom," along with mechanisms of transmission and dissemination of the latter. The effects of endophytes on cassava production will be investigated.

Biological control of mites, mealybugs, and hornworms will emphasize the collection, identification, and interaction of major natural enemies. The Cassava Program will study biochemical interactions between pests and cassava, emphasizing the role of calcium and other plant elements and especially hydrogen cyanide (HCN) content in leaves and roots. It will

initiate bioecological studies of pest behavior in cassava and intercrops. It will give new emphasis to pests in dried cassava and in true cassava seed production. It will initiate studies on pest population dynamics in wild species of Manihot. It will schedule research to determine the biodiversity and origin of cassava pests.

New activities include the identification of environmental factors and management practices that influence cassava root quality for fresh human consumption and the agronomic implications of cassava true seed propagation.

The Cassava Program has planned varietal impact studies in Cuba, Colombia, Brazil, Thailand, and Indonesia, in collaboration with the respective national programs. A diagnostic and constraints identification project in Vietnam will continue into 1991. Monitoring of integrated projects in Colombia, Ecuador, Paraguay, and Brazil at the macro level will be started in 1990 for Ecuador, Thailand, and Brazil, and will continue through 1991.

In the area of utilization and processing, emphasis will be on strategic research, including economics, product quality, and basic studies on the properties of cassava flour in food industry processes.

Cassava quality research will focus on improving analytical and rapid field HCN determination methods for varietal screening and optimizing HCN elimination during processing. Studies will concentrate on the effects of the preharvest environment, especially water stress, on root HCN content. The properties of cassava starch will be characterized and the genetic and environmental variability of these properties analyzed.

Studies relating eating quality to root chemical composition to identify the reasons for poor eating quality will result in providing the consumer with a fresh product of consistent high quality.

3 Rice Program

Achievements

- Two new varieties have been developed for the Colombian LLDCS and represent the first commercially released lines coming from the Santa Rosa station, a disease "hot spot". The lines show excellent blast and "hoja blanca" virus (HBV) resistance, necessary features for the introduction of integrated pest management (IPM) techniques in areas where both diseases are present.
- The stability of lines selected for blast resistance at Santa Rosa has been monitored. Results indicate that

after six seasons of continuous rice planted under high disease pressure, lines remain stable

- Cold-tolerant, high-yielding lines with good grain quality that are derived from anther culture have been advanced to the final evaluation stages in Chile. In addition to having cold tolerance at the seedling stage, the lines were found to be as tolerant as the local tolerant checks during low temperatures at flowering
- A new crossing method has been developed, and it simplifies the process, reduces labor requirements by up to 66%, takes only 20% of the space, and yields 20%-30% over conventional methods. Tillers are excised in the field and maintained in flasks in the greenhouse
- A collaborative effort is under way with national programs in Ecuador and Venezuela to develop national rice research strategies, as was done recently in Colombia. CIAT's role is to help support and orient activities such as sector diagnosis, identification of priority areas, and development of a work plan. Backstopping in the areas of training and consultation will be provided
- A national census for the Colombian rice sector has been conducted and a detailed distribution map for rice in Latin America completed. At both levels, small farms were shown to constitute a larger-than-expected segment of the rice-growing community
- A regional NARS survey was conducted, focusing on human resource availability and activity. Results showed experienced and well-trained staff, with orientation skewed strongly toward breeding and agronomy but lacking in plant protection, training, extension, and socioeconomics
- The new acid-tolerant lines, responsive to inputs and showing excellent grain quality, have been field-tested by NARS with promising results. In areas where significant upland rice is produced on acid soils, CIAT's savanna lines performed extremely well, with yields averaging 30% over local checks and having superior grain quality and lodging resistance
- The Rice Program and Tropical Pastures Program have initiated a collaborative project to develop a rice-pasture rotation system for the acid-soil savannas and Cerrados of Latin America. The project's aims are to develop a sustainable production system for poor soils based on the premise that a productive rice crop will permit the establishment of an improved grass-legume pasture by defraying the establishment costs of the pasture

Strategies

- A** Contribute to achieving and sustaining the genetic yield potential in irrigated systems while reducing external inputs, and expand rice-growing alternatives in upland systems
- Broaden the genetic base of commercially suitable varieties in Latin America
 - Develop screening and evaluation methods relevant to NARS needs and provide them with good parental materials
 - Generate integrated crop management technologies for a more judicious use of agrochemicals
 - Develop germplasm and cropping system alternatives for the acid, high-rainfall savannas
- B** Improve the knowledge base of crop-environment and socioeconomic relationships in Latin America and the Caribbean
- Determine factors mediating the importance, variability, and interaction of key biotic constraints of regional importance
 - Study mechanisms of varietal tolerance to HBV and acid soils
 - Understand factors controlling grain quality components and their implications for alternative uses of the product
 - Assess implications that socioeconomic issues have for technology relevance, transfer, and adoption
 - Strengthen capability of selected NARDS to design and implement national research and training plans
- C** Strengthen the capabilities of NARDS to design and implement national research and training plans
- Meet the needs currently addressed by the general training course by developing national training capabilities that will replace it with more specialized and intensive training opportunities
 - Explore the possibility of strong national programs assuming some regional training responsibilities

- Link specific research activities of the Program with advanced educational and research needs of NARDS scientists

Emphases in 1991

Nineteen ninety-one will be the year during which the Program begins implementing the major strategic shifts already anticipated in the draft strategic plan. These adjustments will mark a relative increase in emphasis directed toward the high-rainfall upland areas--as compared to irrigated areas--directing breeding to more strategic activities such as population improvement, expanding our initiatives in the areas of integrated crop and pest management, conducting region-specific strategic research, and directing training activities toward mid-career scientists as opposed to entry-level scientists.

Upland activities will consist of further development of upland populations adapted to the high-rainfall, acid-soil environments prevalent in Latin America. The Rice Program will give considerable attention to the development of appropriate rice-pasture associations and appropriate agronomic practices. It will collect base-line data on pests in preparation for developing IPM approaches for these environments and more complex systems. A principal focus will be to begin quantifying the agronomic, ecological, and economical sustainability of alternative systems.

Breeding will focus on the development of populations from which parental material for use by national programs may eventually be drawn. The application of the results of RFLP (restriction fragment length polymorphisms) mapping for disease resistance will begin in gene pyramiding for blast and "hoja blanca" resistance.

The Rice Program will begin to apply the techniques and concepts developed for ICM/IPM over the previous years at the field level for "ground testing." It will give particular attention to the interaction of management alternatives and their effects on nontarget pests. It will meld the socioeconomic implications of management alternatives into the integrated approaches.

The relative investment in region-specific strategic research will increase, offsetting reduced activities in some areas of breeding and related activities. The increase in strategic research will be most significant in entomology, pathology, and breeding, and will take advantage of biotechnological advances. The Program will give special attention to the mechanisms of adaptation to acid soils and the possibility of combining upland root systems with irrigated plant types.

Training efforts will be primarily oriented toward bringing national program scientists up-to-date in rice research. This will be achieved by making available intensive specialized training in the principal research projects of the Program to mid-career scientists from the region.

Tropical Pastures Program

Achievements

- Further expansion of the germplasm base has been achieved, with the current collection comprising over 23,000 entries of grasses and legumes. In conjunction with the RIEPT (Red Internacional de Evaluacion de Pastos Tropicales), several key species have been identified for their adaptation and potential in major ecosystems. These are the grasses Andropogon gyanus, Brachiaria brizantha, B dictyoneura, B humidicola, and Panicum maximum, and the legumes Arachis pintoii, Centrosema acutifolium, C brasilianum, C macrocarpum, C pubescens, Desmodium ovalifolium, Stylosanthes capitata, and S guianensis.
- Full decentralization of screening efforts has been achieved with the establishment of four major screening sites representing contrasting ecosystems and farming systems-- savannas, Cerrados, the Amazon, and Central America.
- A clear advantage has been demonstrated in the performance of animals grazing grass-legume pastures compared with those grazing pastures of the same grass without legumes or native savanna. The productivity of A gyanus sown with S capitata was about 50% greater in animal liveweight gains per head and 18% in gains per hectare than those of the grass alone. The productivity of the associations is twice that of native savanna in terms of liveweight gain per head, and 15-fold in terms of gain per hectare.
- For the degraded lands of the rain forests, new grass-legume pastures that effectively fix N and capture and recycle limited soil nutrients are being identified. Results from NARS' grazing trials show that new grass-legume pastures increase yearly weight gains per hectare over degraded pastures more than threefold.
- The RIEPT has matured to meet the strong regional demand for in situ development of relevant low-input technologies. It includes participants from 20 countries and more than 300 researchers. More than 730 preselected germplasm entries have been evaluated for adaptation, and selections are being assembled into pastures tested on-farm under grazing and seed multiplication. From this

cooperative continental research effort, several grasses (A gayanus CIAT 621 and B dictyoneura CIAT 6133) and legumes (C acutifolium CIAT 5277, S capitata CIAT 10280, S macrocephala CIAT 1281, S guianensis CIAT 184, and S guianensis var pauciflora CIAT 2243) have been released by NARDS

- Adoption of released materials is under way A gayanus is being used commercially in the Brazilian Cerrados, where more than half a million hectares have been planted. Over 50,000 hectares have also been planted in Colombia and Venezuela, with smaller areas planted in Central America. The legume S capitata is presently being grown on more than 5,000 hectares in the Colombian Llanos, mostly in association with A gayanus.

Strategies

- A Document the soundness and commercial feasibility of grass-legume pastures
 - Establish sharply focused research and development case studies in contrasting pasture-based farming systems
 - Promote the development of public and private enterprise systems of seed supply, addressing constraints to the rapid and effective release of new cultivars
- B Enhance the capacity of improved pastures to maintain or recover soil quality of pasture-based production systems on marginal lands
 - Develop techniques and methods to quantify nutrient cycling in grass-legume pastures under different soil and management conditions
 - Understand the processes governing soil-plant-animal-management interfaces under pastures for effective animal production, nutrient cycling, and sustainability
- C Develop sustainable pasture-based production systems on marginal lands
 - Selectively broaden the germplasm base of some grasses and herbaceous and woody legumes
 - Develop low-cost, low-risk technologies for the integration of pastures in relevant sustainable production systems
- D Strengthen national capabilities in the context of supply and demand for legume-based pasture technologies
 - Strengthen the RIEPT network by providing new relevant germplasm and research approaches and methodologies for the effective solution of regional pasture problems

Cooperate with ILCA/IEMVT (International Livestock Center for Africa/Institut d'Elevage et de Medecine Veterinaire des Pays Tropicaux) and CSIRO (Commonwealth Scientific and Industrial Research Organization) to develop regional networks in West Africa and Southeast Asia, respectively

Emphases in 1991

The Tropical Pastures Program research activities in 1991 will include selected adjustments to those implemented during the previous year. In the area of germplasm collection and initial characterization, the trend will continue to be a decreased effort in a highly selective expansion of the collection, which will be paralleled by a very modest increase in breeding for selected characteristics in strategic species such as Brachiaria and Centrosema. Research networking through the RIEPT will expand, especially in the area of multilocational screening of promising germplasm.

On-station research on pasture establishment, reclamation, and development will decrease, while more basic studies addressing issues of nutrient cycling and the soil-plant-animal interfaces will experience a modest increase in resource allocation as a consequence of on-station experiments established in mid-1990. In coordination with the Rice Program, the Tropical Pastures Program will further increase its research in crop-pasture rotation for the savannas (Colombia and Brazil). Finally, seed supply activities are projected to further increase in step with the expanded evaluation activities of promising germplasm.

FINANCIAL/BUDGETING INFORMATION 1989 and 1990

Tables 1 to 8 in the Appendix provide details for financial years 1989 and 1990. All references in the text below to the 1989 budget refer to the 1989 budget as published in the CGIAR-approved "Funding Request for 1990" issued in July 1989.

1989 Income from donors for essential activities amounted to \$28,421,000. Together with self-generated income of \$840,000, a total of \$28,961,000 was available for CIAT's essential activities in 1989 (excluding an allocation of \$300,000 for the External Reviews conducted in 1989). On the expense side, operational costs were \$26,321,000, while capital expenditures amounted to \$2,607,000. The balance of \$33,000 was applied to the working capital fund.

1990 Against an approved budget of \$31,316,000, available funding was expected to amount to \$28,916,000. The working budget established by CIAT for 1990 calls for operational expenditures of \$27,106,000, and capital/replacement expenditures of \$1,810,000. Notice

that if we deduct the provision for price increase of \$1,152,000 (i.e., 4 percent of available funding in 1989--\$28.8 million), the available funding in 1990 in constant dollars is \$27,764,000, which is \$1,036,000 less in real terms than in 1989

Operating Expenditures

1 Commodity Research Programs

1989 Total expenditures for commodity research programs were as projected in CIAT's "Funding Request for 1990". Slightly higher expenditures in the Tropical Pastures Program were offset by an equivalent underspending in the Cassava Program. The latter was made possible by not filling the agronomist/breeder position (based in Brazil) for the development of a germplasm pool for semi-arid production conditions, and by the late recruitment of the IITA/CIAT cassava scientist stationed at IITA in Nigeria.

1990 In the 1990 budget year, in constant dollars, the overall amount budgeted for the commodity research programs remains essentially the same as in 1989. Because of budgetary underfunding, CIAT could not add any new senior staff positions as had been approved earlier. The working or "estimated" budget as shown for the commodity research programs includes a series of downward adjustments introduced to reduce costs, especially in the areas of temporary and overtime labor, and international/national travel. The Rice Program budget shows a decrease of \$100,000 in accordance with the phasing down of the rice development work as an "essential" activity as described in the medium-term plan. This is compensated by a new allocation to the Rice Program of \$150,000 for the carrying out, in collaboration with the Tropical Pastures Program, of a research effort on the development of rice-tropical pastures production systems for the acid-soil savannas of tropical South America. The apparent increase in the budget for the Bean Program is entirely due to shifting resource allocation patterns--mostly from training to nontraining-related activities--in the highly restricted portion of the "essential activities" related to bean research/development activities in Africa, Central America, and the Andean Region. (NOTE: the highly restricted portion in essential activities of the Bean Program amounts to 49 percent of the Bean Program budget for essential activities.)

2 Research Support

1989 Expenditures in research support were some \$4.9 million, versus a budget of \$5.2 million. Notable is an

underspending of \$150,000 for visiting scientists and postdoctoral fellows. Also, the nonfilling of the positions for Biochemist (Biotechnology Research Unit) and Agricultural Geographer (Agroecological Studies Unit) resulted in selected underspending in the respective support units.

Under Research Support, CIAT is listing the "animal herd" as an expense item for 1989, without a corresponding budgeted amount. The animal herd is meant to be a self-sustaining activity which provides the Tropical Pastures Program with animals for research purposes, and at the same time produces sufficient income from the sale of the animals to pay for the operation of the herd. In 1989, the operational costs of the herd were higher than expected. In addition, with a very large number of slaughter animals on the market because of Colombian internal socioeconomic reasons, meat prices were excessively depressed. This has required a substantial adjustment in CIAT's valuation of the animal inventory. The expenses listed under this item (\$185,000) reflect the cost of these two factors.

1990 In the 1990 working budget, funds for visiting scientists and postdoctoral fellows were reduced by \$184,000. At the same time, an upward adjustment for the Genetic Resources Unit was made to provide that unit with adequate resources for it to provide basic germplasm-related services not only to beans but also to tropical pastures and cassava. In the Agroecological Studies Unit, because of a lack of resources the Agricultural Geographer position is no longer budgeted in 1990, however, this position is proposed to be operationalized in 1991 (see below). In addition to the specific modifications listed above, all the research support units were asked to introduce selected economies into their operational expenses. Overall, in real terms, the 1990 budget for research support activities is some \$470,000 below the 1989 budget levels.

3 Training/Communication/Information

1989 Training/communication/information activities showed higher-than-budgeted expenditures of some 9 percent, which was primarily due to a higher-than-anticipated level of training activities in the highly restricted portions of the approved essential program.

1990 In the 1990 budget, the "Training Materials Development Section" (approximate costs \$105,000/year) is budgeted in the "Training & Conferences" line item, rather than in the "Communication/Information" item. This increase in the training budget is counter-balanced by a shift away from training in the highly restricted portions of essential

activities Furthermore, a temporary reduction in training scholarships amounting to some \$50,000 was introduced for 1990 as a temporary saving to meet the funding shortfall

4 Management/Administration

- 1989 Expenditures for management and administration were essentially as budgeted
- 1990 The budget for the office of the Internal Auditor (\$110,000) was reassigned to "Administrative Support " In constant dollar terms, the area of Management and Administration was trimmed significantly in view of budget underfunding to liberate resources (\$50,000) for the addition of an administrative support function in Villavicencio (in the foothills of the Llanos of Colombia), where CIAT maintains a research station for the Rice Program, and the Cassava and Tropical Pastures Programs are actively represented

5 General Operating Expenses

- 1989 General operating expenses were slightly below budget (\$2,633,000 actual versus a budget of \$2,695,000)
- 1990 The proposed budget for "General Expenses" for 1990 (a reduction of \$120,000 in real terms) is based on CIAT's experience in 1989, and its best estimate of costs for the items involved in 1990

Capital Expenditures

- 1989 Capital and capital replacement expenditures amounted to \$2,607,000 versus a budgeted amount of \$1,899,000 In the second semester of 1989, and in view of the very high demand for additional capital items caused by the Center's gradual forays into more "upstream" research, and the need to upgrade the mainframe computer installations, the decision was made to curtail to the maximum operational expenditures in order to be able to allocate an additional amount of some \$700,000 to capital With the achievement of this goal, CIAT was able to invest some \$350,000 in so-called "advanced research equipment" and \$220,000 in the acquisition of an IBM AS/400 computer The balance (\$120,000) was incorporated into the "Capital Development Fund "
- 1990 The 1990 budget for capital and capital replacement is \$1,810,000, i e , \$159,000 below 1989 levels in constant terms (and \$384,000 below the level originally approved for the 1990 budget year) Among other items to be reduced, the postponement of the expansion of the laboratory/office space complex as described in the mid-term plan (\$200,000) for 1991 will be required

Earned Income

- 1989 CIAT budgeted \$700,000 for self-generated income such as farm production, financial income (mostly interest), and overhead charged on special projects. Higher-than-anticipated income from the farm operation and from overhead more than compensated for the fact that in 1989, no net financial income was generated (caused by the flow of payments from donors that was distinctly skewed toward the end of the year, thus causing important cash flow difficulties). Total self-generated income in 1989 was \$840,000.
- 1990 For 1990, self-generated income is estimated at \$816,000. The slight reduction over 1989 is attributable to a reduction in income for overhead.

Donor Funding

- 1989 In 1989, donor funding for essential activities amounted to \$28,421,000. An additional amount of \$4,294,000 was available for "desirable activities."
- 1990 In 1990, income from donors for essential activities is expected to amount to \$28,100,000. In addition, CIAT is proposing \$5,619,000 for "desirable activities." At the end of April 1990, CIAT estimated that of this amount some \$3,288,000 would actually be funded. Table A below lists the "desirable activities" projected for 1990, together with a status report on funding availability.
-

TABLE A

Desirable Activities for the 1990 Budget Year
(Amounts shown are in thousands of US dollars)

<u>Activity</u>	<u>1990 Budget</u>	<u>Donor</u>
BEAN PROGRAM		
-Africa Great Lakes Region, eastern and southern Africa (*)	1,713	USAID/CIDA/SDC
-Andean region (*)	229	SDC
-Research on <u>Phaseolus</u> germ- plasm	135	Italy
-Bean research/development program for West Africa & northern Africa (*)	437	Not yet funded
CASSAVA PROGRAM		
-Germplasm development for northeast Brazil & similarly dry areas in Africa, executed by Brazilian institutions	224	IFAD
-Development of production & processing technologies (*)	89	Kellogg Foundation
-Development of production & processing technologies (*)	89	FUNDAGRO, Ecuador
-Development of cassava processing technologies (flour and flour products) (*)	76	IDRC
RICE PROGRAM		
-Caribbean Rice Improvement Network (CRIN)	239**	CIDA
-Rice research and development network for Central America (*)	218	Not yet funded
-Rice research and development network for Southern Cone (*)	218	Not yet funded
TROPICAL PASTURES		
-CIAT participation in West Africa Forage Network (WAFNET)	45	Japan
-Research for the improvement of native grasslands	65	Japan
-Characterization and comparison of isolates of <u>C. gloeosporioides</u> causing anthracnose of <u>Stylosanthes</u>	72	Australia

Table A, continued

-Study on socioeconomic aspects of improved pastures	28	FUNDAGRO, Ecuador
-Placement of CIAT Pasture Agronomist with ILCA (*)	218	Not yet funded
RESEARCH SUPPORT		
-Biotechnology research for rice	100	Rockefeller Foundation
-Farmer participation research (*)	184	Kellogg Foundation
CONTINGENCIES (*)	44	Not yet funded
CAPITAL (*)	827	Not yet funded
WORKING CAPITAL (*)	369	Not yet funded
	TOTAL	5,619

(*) = Included in projections in medium-term plan for 1989-1993
 (**) = An additional amount of \$371,000 is shown as essential
 activity as listed in the medium-term plan for 1989-1993

III FUNDING REQUEST FOR 1991

CIAT's funding request for essential activities for the 1991 budget year is \$32,672,000. In terms of constant U S dollars, this amounts to some \$500,000 less than the originally approved request for 1991 as presented in the medium-term plan (\$33,185,000). In terms of a comparison with actual funding in 1990, the 1991 funding request is some 2.5 million constant dollars above the resources available in 1990. Table B shows the 1990 budget base, and lists all proposed modifications to this base in order to arrive at the 1991 funding request.

TABLE B

Proposed Budgetary Variations for 1991
(Essential Activities)

1990 Budget Base		\$28,916,000	
<u>Changes Pertaining to 1990 Budget Year</u>			
Plus	I	Adjustment in working capital postponed from 1989 and 1990	320,000
	II	Temporary reductions introduced in 1990 and proposed for reinstatement in 1991(*)	479,000
	III	Filling of position for Agricultural Geographer in Agroecological Studies Unit	148,000
	IV	Delayed additions of senior staff positions originally approved for 1990	
	a	Head, Training	154,000
	b	Cassava Breeder (HQ-based)	267,000
	c	Cassava Quality Specialist	267,000
	V	Delayed other additions originally approved for 1990	
	a	Increase in resources for research contracting	44,000
	b	Construction of research services building	198,000
			<u>1,877,000</u>

Changes Pertaining to 1991 Budget Year

Minus	VI	Reductions as projected in the mid-term plan for 1991 budget year		
	a	Bean Agronomist (Central America)	(122,000)	
	b	Support for Africa cassava study	(75,000)	
	c	Regional rice project in Caribbean	(300,000)	
Plus	VII	Additions as projected in the mid-term plan for 1991 budget year		
	a	Senior staff positions		
		1) Cassava Economist (Asia)	209,000	
		2) Tropical Pastures Agroecosystem Specialist (Humid Tropics)	220,000	
		3) Molecular Geneticist (Bio-technology Research Unit)	267,000	
	b	Increase in resources for research contracting	44,000	
	c	Provision for price increase 1990/1991 (4.5% of \$30,716,000)	1,382,000	
VIII		Adjustment in working capital (i.e., covering net additions in 1991)	254,000	1,879,000
			<hr/>	<hr/>
		Total 1991 Funding Request		32,672,000
IX		Self-generated income		(716,000)
				<hr/>
		Requested from CGIAR		\$31,956,000
				=====

* The value of all economies introduced was \$1,152,000, of this amount, CIAT proposes to indefinitely incorporate reductions of \$525,000, but to reinstate \$479,000 to partially offset temporary reductions in training scholarships, support for visiting scientists and postdoctoral fellows, and research support services

1277
 189

 1467

1 Commodity Research Programs

1 1 Net Reductions

As indicated in the medium-term plan, the position for On-farm Agronomist (Beans) in Central America and the Caribbean will be shifted from essential to desirable beginning with the 1991 budget year. The reduction implied by this shift amounts to some \$122,000. Similarly, the medium-term plan projected a further reduction in 1991 in the activities of the Caribbean Rice Network (budgeted in the Rice Program), classified as essential. Specifically, the reductions foreseen in 1991 amount to some \$300,000.

1 2 Delayed Addition of Positions

As of the 1990 budget year, the commodity research programs were staffed as was proposed in the 1989-1993 mid-term plan, with the following exceptions. First, the position for Cassava Agronomist/Breeder that was to be stationed with the Brazilian national institution was not operationalized for lack of resources and the possibility to contract the work involved directly with the Brazilian national institution, using special project resources. Second, for lack of available resources, the following two positions were not implemented, but herewith are proposed to be implemented in the 1991 budget year.

Cassava Breeder The medium-term plan projected this headquarters-based position for 1990. The recent convergence of a series of events confirms the urgency to this appointment. The following activities are not necessarily to be assigned specifically to this position (second breeder in the program), but they indicate the range of new activities anticipated in breeding.

- a) With the placement of a CIAT/IITA scientist at IITA, the demand from Africa for germplasm and other inputs from headquarters will increase significantly. This has already been seen to some degree in early 1990, when the Breeding Section sent more seeds to IITA than in all previous years combined.
- b) CIAT is committed to major input into a project for developing semi-arid and subtropical adapted germplasm in partnership with Brazilian institutions. In the interest of promoting an innovative IARC-NARS collaboration, CIAT opted against using a TAC-approved core breeder position in Brazil.
- c) CIAT is planning to become more involved in building a wild Manihot species collection, evaluating it, and planning for its utilization in practical breeding programs. The long-term sustained improvement in cassava will depend on exploiting the widest possible range of germplasm resources.
- d) CIAT has developed a framework for research in the area of developing a commercial true seed propagation system for

cassava High payoffs are expected, but major research input will first be required

- e) Advanced research techniques for the genetic manipulation of cassava are on the horizon Much of this work will be done in advanced laboratories in other institutions CIAT, however, will provide a key link to the application of these technologies with major input from the Breeding Section
- f) Some 20% of the world's cassava is produced in the subtropics So far, neither CIAT nor IITA has devoted much effort to this ecosystem The development of a network of subtropical countries is anticipated, and breeding will be a major activity

Cassava Root and Leaf Quality Specialist Consumers increasingly require products of consistent high quality Yet traditional cassava products are characterized by a highly variable quality, for reasons which are not understood CIAT proposes to establish a Quality Section in its Cassava Program, whose purpose will be to conduct strategic and applied research to generate an understanding of the factors--genetic, environmental, and process-related--which affect end-product quality In addition, for cassava to realize its potential as a multi-end-use crop with a diversity of food uses, a range of novel food products based on cassava flour and starch must be developed The functional properties of these root components, based on their physiochemical characteristics, and the genetic and environmental effects on these properties and characteristics must be understood if this objective is to be met

The Quality Section will pay particular attention to HCN, an issue that is becoming increasingly important, especially in Africa, where human toxicity problems have been identified The Section will develop more precise rapid analysis methods to facilitate the identification of low-HCN germplasm, study preharvest environmental effects on root and leaf HCN content, and determine the conditions for optimal HCN elimination during processing

Quality Section research will be linked to that of the Breeding, Agronomy, and Utilization Sections and will complement the more basic studies being carried out by institutions participating in the Cassava Biotechnology Network The objective will be the provision of consistent, high-quality cassava-based products through genetic, crop management, and processing improvements

3 Additions as Originally Proposed for 1991

In addition to these two positions, CIAT proposes to implement the following two positions as originally proposed in the mid-term plan for the 1991 budget year

Cassava Economist in Asia CIAT confirms the requirements of the services of an economist in Asia, since the dynamics in production,

marketing, and trade of cassava products on this continent cannot adequately be monitored by the headquarters economist

World cassava production is 137 million tons. Approximately 38% of this volume is produced in Asian countries. Most cassava in Latin America and Africa is domestically consumed in fresh and/or semi-processed form. In Asia, cassava forms the basic or intermediate product for the manufacturing of a wide range of value-added end products for human and animal consumption for both domestic and export markets.

The Asian-based economist needs to pay special attention to the following aspects:

- a) Through base-line diagnostic studies identify and analyze current constraints in cassava production and marketing
- b) Ensure that new production technologies are appropriate and fit into the intricate Asian cropping systems and have a high probability for adoption by farmers
- c) Analyze processing and utilization of cassava at both household level (e.g., Vietnam) and industry level (e.g., Thailand) and feed information back to the Utilization Section at headquarters
- d) Build a data base of socioeconomic indicators relating to cassava for Asian countries and monitor the dynamics of prices and market shares of the different cassava products for domestic and export purposes
- e) Analyze the potential of new cassava-based products
- f) Build and actively take part in the Asian socioeconomic network with CGPRT (Regional Center for Research and Development of Course Grains, Pulses, Roots and Tubers [Bogor, Indonesia]), CIP (Centro Internacional de la Papa), CIMMYT (Centro Internacional de Mejoramiento de Maiz y Trigo), and NARIS
- g) Analyze cassava potential in those countries bypassed by the Green Revolution, such as Vietnam, Laos, Cambodia, and Burma

Tropical Pastures Program Agroecosystem Specialist (Humid Tropics) The rain forest of tropical America is being deforested at a rapid rate. Degradation of pastures and lack of sustainability of crop production after clearing and burning have been one of the forces behind continued deforestation. In recent years, the Tropical Pastures Program has expended a major effort in screening and selecting adapted grasses and legumes, many of these have advanced to the stage of on-farm testing, and some of these materials have already become commercial cultivars. In addition, encouraging progress has been achieved by selected national programs and other international institutions in the area of developing tree components for acid soils. This opens up the possibility of

reclaiming large areas of degraded lands by integrated perennial herbaceous and woody components in multilayered systems, thus reducing the pressure on further deforestation. However, this requires a major research effort to study the interactions among components for the understanding of ecological principles to develop alternative land use in this fragile ecosystem.

The scientist required will lead the research effort by bringing in expertise from CIAT and other national and international institutions.

1.4 Change List

As described in the mid-term plan, the Tropical Pastures Program proposes to proceed with the following change list, or substitution of senior staff positions, in 1991.

Tropical Pastures Phasing out of Germplasm Evaluation Specialist and phasing in of Agroecologist in the Savannas. After 15 years of emphasis on the tropical pastures germplasm collection, the world collection of tropical grasses and legumes for acid soils now consists of more than 24,000 accessions. A large proportion of this collection has been screened for adaptation to major ecosystems, and key species have been identified. As a consequence, the Tropical Pastures Program anticipates that with responsibilities for germplasm collection, initial characterization, conservation, and distribution of pastures germplasm transferred to the Genetic Resources Unit, the Program can reduce its germplasm activities to strategic work on germplasm acquisition.

As a result of previous efforts of the Program, new grasses and legumes are now commercially available for the Colombian Llanos. Similarly, highly promising experimental upland rice lines and new cassava cultivars are being tested in these acid soils. Other institutions are also developing lines and varieties of sorghum (INTSORMIL), maize (CIMMYT), soybeans (ICA, Colombia), cowpeas (IITA), oil palm (ICA), and other crops, adapted to acid soils. At this time, there is a need to study how best to integrate pastures and various crops in economically viable sustainable agropastoral systems of the Llanos.

The Agroecosystem Specialist position is proposed to replace the Germplasm Specialist position. Such a systems specialist is to assemble the required knowledge base, and interact with CIAT scientists and other institutions so as to develop intensified integrated land-use systems options for the tropical savannas.

No net change in the budget is anticipated due to this substitution of senior staff positions in the Tropical Pastures Program.

2 Research Support

The same resource patterns as applied to the 1990 budget are proposed to be applied in 1991, with the following modifications.

2 1 Addition of Position for Agricultural Geographer

For cost reasons, the earlier approved position for Agricultural Geographer in the Agroecological Studies Unit (AESU) could not be operationalized. It is proposed to add this position beginning with the 1991 budget year.

Over the years, the AESU has developed extensive data bases, data collections, and methods to serve the commodity programs and CIAT management in defining the physical environment, agricultural system, and socioeconomic milieu for each of the CIAT mandate commodities. These studies proceed logically from the general to the specific. They start with continental-scale studies of crop geography with an accent on the physical environment and proceed to much larger scale studies of small regions, where socioeconomic variables become relevant. In all of these, spatial considerations are an important factor.

In the coming years, the accent will shift from continental-scale geography to detailed studies of natural resource use and the effect of CIAT commodities on the agricultural environment. This will involve regional analyses with a strong emphasis on socioeconomic factors and farmer aspirations and practices.

The geographic and social input has been, until now, provided by a series of temporary doctoral and postdoctoral fellows. With the increasing emphasis on long-term studies in sustainability, probably in conjunction with national programs and NGOs, temporary arrangements will lack the necessary continuity to build solid programs and firm links with our partners.

Current senior staff ensure continuity of expertise in computing and physical and biological sciences. CIAT is therefore requesting to implement the senior staff position of Agricultural Geographer.

2 2 Position for Molecular Geneticist in the Biotechnology Research Unit

When the BRU was created in 1985, the plan for staffing the Unit contemplated three senior scientist positions in the areas of cell and tissue culture, biochemistry/molecular biology, and cytogenetics.

Recently, the biochemistry/molecular biology position was changed to one which will predominantly focus on biochemical research due to increasing demands by CIAT programs in this research area. The cytogeneticist position was, in turn, changed to one which will deal with molecular genetics since the recently hired new head of the GRU will provide the cytogenetics input. Thus, the three senior positions--cell and tissue culture, biochemistry, and molecular genetics--are considered the minimum essential strategic research support for the application of the new biological methodologies to CIAT commodities.

The plant physiologist in charge of cell and tissue culture research was, until the end of 1989, the only senior position in the BRU, and this person has additional duties as Head of the Unit. The second senior position--plant biochemistry--was implemented in the first semester of 1990. The primary responsibility of the scientist in that position is to provide research support to identify the biochemical factors which underlie the mechanisms of resistance/tolerance in selected plant pathogen-pest interactions. In addition, the biochemist will help to develop biochemical markers for the characterization and assessment of genetic variability in CIAT crops.

Once the factors responsible for resistance/tolerance have been pinpointed, the next step will be to relate those (proteins, enzymes, etc.) to the genetic make-up of the plant by means of molecular biology techniques. Agronomically useful genetic constructions are also available from other plant species. Furthermore, CIAT needs to enhance its capacity to exploit available (and develop new) molecular genetic markers and maps in plant breeding. This will be achieved by the use of gene mapping, cloning, and transfer techniques. The proposed third senior position in the BRU, a plant molecular geneticist, will be responsible for this research support activity in direct collaboration with plant breeders in the research programs. It is also expected that this position will greatly contribute to the interface in research at the cellular, biochemical, and molecular levels in the Unit with collaborating advanced research institutions and with the work of practical plant breeding at CIAT and the NARS. The selection of the scientist to fill the molecular genetics position will have to take into account both a strong molecular biology background and demonstrated experience in plant genetics and breeding.

3 Training/Communication/Information

3.1 Head, Training

The position for Head, Training, was originally approved for the 1990 budget year. Its implementation was delayed because of the funding shortage. The background for the proposal to implement this position in 1991 follows.

In 1987, CIAT's Training and Conferences Activities were merged with the former Communications and Information Support Unit to become the Training and Communications Support Program (TCSP) under a single leader and with status equivalent to the Center's commodity research programs. The Program was to have four major thrusts: training, information/documentation, publications, and public information. In the short term, the program leader was to cover the roles of both leader and head of training and conferences, but eventually each thrust was to be headed by a senior position. Moreover, a major reason for creating the program was that it should be led by a full-time program leader--in the same way as the Center's research programs, based on the consideration that the TCSP includes a wide

spectrum of activities, and has important responsibilities in institution-building and the provision of support functions for the strengthening of collaborating NARDS

This need, if anything, has become stronger since the merger was implemented. The TCSP's institution-building and enhancing function has shifted from a supply-driven and reactive approach to one that is proactive and highly targeted. Instead of being moved by the Center's "supply" capacity for providing information, knowledge, and training, and providing service simply upon request, the TCSP now channels the Center's expertise and stock of information to meet clearly defined needs of the NARDS. For this, the TCSP follows a Center-wide approach and keeps a country-level perspective to guide the Center's NARDS-enhancing endeavors. In other words, it strives to assess the needs of the individual countries' technology generation and transfer systems as a whole (in relation to CIAT's commodities) vis-a-vis the more restricted needs and perceptions of individual institutions or commodity programs within national systems. It likewise strives to ensure that CIAT's response to NARDS' needs is determined from a Center-wide standpoint, rather than from an exclusively commodity program point of view. This requires the attention of a full-time program leader.

The TCSP's training function, on the other hand, has become more complex. The strategic shift toward more upstream training of NARDS scientists had to be paralleled by an effort to strengthen the NARDS' own capacity for training their human resources devoted to downstream research and technology transfer. Consequently, the TCSP developed a strategy of training the trainers to cover the downstream training demand, as a complement to CIAT's upstream research training.

All this implies that the functions of training head and TCSP program leader should not continue to be carried out by a single person. It is therefore proposed that the position of Head of Training be implemented not later than 1991.

4 Management/Administration and General Operating Expenses

There are no additions for Management/Administration and General Operating expenses.

5 Capital/Replacement Capital

The request for capital and capital replacement funds is as presented in the medium-term plan for the 1991 budget year, plus the amount of \$200,000 for the addition of one module to the laboratory/office space complex whose construction needed to be postponed in 1990 for lack of funds.

6 Working Capital

The adjustment in working capital requested for 1991 amounts to \$574,000. This amount represents some 8.2 percent (i.e., 30 days of operations) of the net additions made to the 1989 budget (in 1989, CIAT was asked to implement the additions proposed for 1989 but to postpone the addition of the corresponding working capital), plus the same percentage for additions proposed for the 1991 budget year. (Because of underfunding in the 1990 budget, no net additions to the CIAT program were made in 1990, nor was it possible in the 1990 budget year to add the working capital additions as postponed in 1989, as shown in Table 2 [item I], the resources needed to "catch up" with working capital to the year 1990 amount to \$320,000.)

7 Self-Generated Income

Earned income in financial year 1991 is projected to be at the level of \$716,000. It includes projected income for farm production, overhead on special projects, and income from financial transactions (mainly interest). The projected reduction of \$100,000 in earned income over the 1990 budget year is based on the consideration that the portion of project funding on which overhead is charged is expected to be less than in 1990.

8 Donor Funding

Vis-a-vis the budget request amounting to \$32,672,000, and projected self-generated income amounting to \$716,000, CIAT's request for funding from the CGIAR amounts to \$31,956,000. Against this request--at the time of publication of this document--CIAT was assured funding (in the form of highly restricted funding) of essential activities in the amount of \$2,129,000.

9 Impact of Funding Request on Medium-term Plan

In terms of the essential program, with the budget request as outlined above, CIAT will stay fully within the originally approved medium-term plan. The only difference relates to the noninclusion of the senior staff position for a Cassava Agronomist/Breeder who was to be stationed in northeastern Brazil, and whose responsibility was to have been the development of a cassava germplasm pool for the semi-arid regions of Brazil and homologous areas in Africa. CIAT, in coordination with Brazilian national institutions, is now planning to devolve the execution of this work to Brazil, and is hopeful that funding for this activity will be forthcoming. CIAT is proposing to include this devolution activity in the "desirable program."

For 1991, CIAT proposes "desirable activities" amounting to \$5.3 million dollars, against which, at the end of April 1990, some \$2.3 million were projected to be available. Table C below lists the specific desirable activities proposed for 1991.

TABLE C
Desirable Activities Projected for 1991
(Amounts are in thousands of US dollars)

<u>Activity</u>	<u>1991 Budget</u>	<u>Donor</u>
BEAN PROGRAM		
-Africa Great Lakes Region, eastern and southern Africa (*)	1,440	USAID/CIDA/SDC
-Andean region (*)	240	SDC
-Research on <u>Phaseolus</u> germ- plasm	64	Italy
-Agronomist for on-farm research in Central American region (*)	150	Not yet funded
-Bean research/development program for West Africa & northern Africa (*)	456	Not yet funded
CASSAVA PROGRAM		
-Germplasm development for northeast Brazil & similarly dry areas in Africa, executed by Brazilian institutions	205	IFAD
-Development of production & processing technologies (*)	103	Kellogg Foundation
-Development of production & processing technologies (*)	77	FUNDAGRO, Ecuador
-Integration of production/ processing/marketing (*)	67	Not yet funded
RICE PROGRAM		
-Caribbean Rice Improvement Network (CRIN)	250	Not yet funded
-Rice research and development network for Central America (*)	228	Not yet funded
-Rice research and development network for Southern Cone (*)	228	Not yet funded
TROPICAL PASTURES		
-Research for the improvement of native grasslands	65	Japan
-Characterization and comparison of isolates of <u>C. gloeosporioides</u> causing anthracnose of <u>Stylosanthes</u>	72	Australia
-Placement of CIAT Pasture Agronomist with ILCA (*)	228	Not yet funded
-Position for Socioeconomist/ Humid Tropics (*)	228	Not yet funded

RESEARCH SUPPORT

-Biotechnology research for rice	100	Rockefeller Foundation
-Farmer participation research (*)	192	Kellogg Foundation
CONTINGENCIES (*)	44	Not yet funded
CAPITAL (*)	856	Not yet funded
WORKING CAPITAL (*)	1	Not yet funded
	<hr/>	
	TOTAL	5,294
	<hr/>	
	<hr/>	

(*) = Included in projections in medium-term plan for 1989-1993

15 June 1990

TABLE 1 A

1991 BUDGET REQUEST BUDGET BY PROGRAMS AND UNITS
 Amounts for Essential Activities (1988 1989 1990 & 1991)
 (amounts are in thousands of current US dollars)

	Actual 1988		Actual 1989		1990 Budget				1991 Budget request		Changes over 1990 estimate	
	SYS	Amount	SYS	Amount	Approved		Estimate		SYS	Amount	\$'000	%
					SYS	Amount	SYS	Amount				
1 OPERATIONS PROGRAMS												
COMMODITY RESEARCH												
BEANS	20	4 585	21	4 412	23	4 657	23	4 913	22	4 791	(122)	(2)
CASSAVA	10	2 190	11	2 381	14	3 312	11	2 543	14	3 269	726	29
RICE	7	1 515	8	1 897	8	1 897	8	1 962	8	1 787	(75)	(9)
TROPICAL PASTURES	17	3 690	17	3 943	18	3 825	18	3 793	19	4 022	229	6
Total Research Programs	54	11 980	57	12 633	63	13 691	60	13 211	63	13 869	658	5
RESEARCH SUPPORT												
VISITING SCIENTISTS & PDFs		553		526		710		526		676	150	29
GENETIC RESOURCES	1	396	1	421	1	440	1	494	1	500	6	1
BIOTECHNOLOGY RESEARCH	1	291	1	356	2	426	2	397	3	678	281	71
VIROLOGY RESEARCH	1	287	2	355	2	382	2	344	2	349	5	1
RESEARCH SERVICES		326		330		335		319		329	10	3
STATION OPERATIONS	1	866	1	941	1	905	1	844	1	860	16	2
CARIMAGUA STATION		658		567		666		618		631	13	2
DATA SERVICES	1	501		524	1	553	1	550	1	559	9	2
AGROECOLOGICAL STUDIES	1	176	1	199	2	346	1	205	2	356	151	74
SEEDS	2	531	2	487	2	590	2	523	2	550	27	5
RESEARCH CONTRACTS						149		100		188	88	88
ANIMAL HERD				185								
Total Research Support	8	4 585	8	4 891	11	5 502	10	4 920	12	5 676	756	15
TRAINING AND COMMUNICATION												
TRAINING AND CONFERENCES		1 375		1 581	1	1 673		1 520	1	1 628	108	7
COMMUNICATION & INFORMATION	3	1 322	4	1 643	4	1 637	4	1 480	4	1 480		
Total Training & Communication	3	2 697	4	3 224	5	3 310	4	3 000	5	3 108	108	4
MANAGEMENT AND ADMINISTRATION												
BOARD OF TRUSTEES		203		140		194		177		177		
OFFICE OF DIRECTOR GENERAL	2	602	2	549	2	571	2	379	2	381	2	1
OFFICES OF DIRECTORS	3	676	3	696	3	713	3	717	3	722	5	1
ADMINISTRATIVE SUPPORT	1	1 453	2	1 855 *	2	1 664	2	1 789	2	1 821	32	2
PROJECTS OFFICE (**)	1		1		1		1		1			
Total Mgt and Administration	7	2 934	8	3 240	8	3 142	8	3 062	8	3 101	39	1
GENERAL OPERATING EXPENSES												
GENERAL SERVICES				1 067		1 122		1 070		1 086	16	1
PHYSICAL PLANT		1 360		691		656		643		659	16	2
MOTOR POOL		616		385		444		419		419		
GENERAL EXPENSES		238		490		622		481		490	9	2
Total General Operating Exp		2 214		2 633		2,844		2 613		2 654	41	2
OTHERS												
PRICE INCREASE CONTINGENCY						313		300		1 278	1 278	
										314	14	5
Total Others						313		300		1 592	1 292	431
Total Operations	72	24 410	77	26 621	87	28 802	82	27 106	88	30 000	2 894	11
2 CAPITAL												
REPLACEMENT CAPITAL		728		725		1 008		980		1 024	44	4
		982		1 882		1 186		830		1 074	244	29
Total Capital		1 710		2 607		2 194		1 810		2 098	288	16
3 WORKING CAPITAL ADJUSTMENT		593		33		320				574	574	
Total Requirements	72	26 713	77	29 261	87	31 316	82	28 916	88	32 672	3 756	13

* Includes US\$300 000 for EPR/EHR

** Paid from Indirect Cost Recovery

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

12/06/90

TABLE 1 B

1991 BUDGET REQUEST BUDGET BY PROGRAMS AND UNITS
 Amounts for Desirable Activities (1988 1989 1990 & 1991)
 (amounts are in thousands of current US dollars)

	Actual 1988		Actual 1988		1990 Budget				1991 Budget request		Changes over 1990 estimate	
	SYs	Amount	SYs	Amount	Approved		Estimate		SYs	Amount	\$'000	%
					SYs	Amount	SYs	Amount				
OPERATIONS PROGRAMS												
RESEARCH												
BEANS	6	1 320	6	2 108	8	1 947	8	2 514	9	2 249	(265)	(11)
CASSAVA	2	126	2	258	3	219	3	478	4	433	(45)	(9)
RICE				159	2	441	2	675	2	676	1	0
TROPICAL PASTURES		164		201	1	221	1	428	2	567	139	32
Total Research Programs	8	1 610	8	2 726	14	2 828	14	4 095	17	3 925	(170)	(4)
RESEARCH SUPPORT												
GENETIC RESOURCES				127								
BIOTECHNOLOGY RESEARCH		12		183				100		95	(5)	(5)
VIROLOGY RESEARCH		19		19								
SEEDS				41								
FARMER PARTICIPATION RESEARCH	1	205	1	175	1	184	1	184	1	184		
Total Research Support	1	236	1	545	1	184	1	284	1	279	(5)	(2)
TRAINING AND COMMUNICATION												
TRAINING AND CONFERENCES		96		321								
COMMUNICATION & INFORMATION		184										
Total Training & Communication		280		321								
OTHERS												
PRICE INCREASE										189	189	
CONTINGENCY						38		44		44		
Total Others						38		44		233	189	430
Total Operations	9	2 126	9	3 592	15	3,050	15	4 423	18	4 437	14	0
CAPITAL												
REPLACEMENT		136		189		276		276		285	9	3
CAPITAL		218		513		551		551		571	20	4
Total Capital		354		702		827		827		856	29	4
WORKING CAPITAL ADJUSTMENT												
						15		369		1	(368)	(100)
Total Requirements	9	2 480	9	4 294	15	3 892	15	5 619	18	5 294	(325)	(6)

TABLE 1 C

1991 BUDGET REQUEST CIAT HOSTED ACTIVITIES OF SISTER INSTITUTIONS (*)
 Amounts for Activities of Sister Institutions (1988 1989 1990 & 1991)
 (amounts are in thousands of current US dollars)

I N S T I T U T I O N	A c t u a l		B u d g e t e s t i m a t e	
	1 9 8 8	1 9 8 9	1 9 9 0	1 9 9 1
INTERNATIONAL BOARD FOR PLANT GENETIC RESOURCES (IBPGR)	155	235	195	195
INTERNATIONAL MAIZE AND WHEAT IMPROVEMENT CENTER (CIMMYT)	163	240	245	256
INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE (IITA)	180	210	224	192
INTERNATIONAL FERTILIZER DEVELOPMENT CENTER (IFDC)	18	35	94	98
INTERNATIONAL RICE RESEARCH INSTITUTE (IRRI)	268	267	246	235
MISSISSIPPI STATE UNIVERSITY (INTSORMIL)	55	30	45	47
TOTAL	839	1,017	1 049	1 023

* Activities shown are those which sister institutions have indicated they wish CIAT to host and which these sister institutions are willing to finance

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TABLE 2 A

1991 BUDGET REQUEST BUDGET BY ACTIVITIES
 Amounts for Essential Activities (1988 1989 1990 & 1991)
 (amounts are in thousands of current US dollars)

ACTIVITIES	Actual 1988	Actual 1989	1990 Budget		1991 Budget request	Changes over 1990 estimate	
			Approved	Estimate		\$'000	%
RESEARCH							
Natural Resources	903	1 038	1 168	1 100	1 222	122	11
Genetic Resources	1 318	1 464	1 453	1 367	1 392	25	2
Crop Improvement	3 735	3 993	4 130	3 887	3 977	90	2
Crop Production	1 758	1 943	2 051	1 930	2 017	87	5
Crop Protection	1 513	1 624	1 738	1 635	1 704	69	4
Livestock Production	757	852	969	911	1 050	139	15
Analysis	635	692	826	777	881	104	13
Utilization	122	160	228	214	256	42	20
Exploratory Res & Method Develop	903	1,118	1,339	1 260	1 477	217	17
Analysis of Impact	73	80	114	107	114	7	7
TOTAL RESEARCH	11,717	12,964	14 016	13 188	14 090	902	7
INSTITUTION BUILDING & NETWORKING							
Training	2 929	3 169	3 419	3 217	3 409	192	6
Conferences and Seminars	732	825	912	858	909	51	6
Documentation & Information	1 270	1 411	1 481	1 394	1 477	83	6
Counseling/Advising NARS	1 294	1 411	1 481	1 394	1 420	26	2
Technical Assistance	439	532	570	536	597	61	11
Network Coordination	1 147	1 251	1,339	1 260	1 364	104	8
TOTAL INSTIT BUILD & NETWORKING	7 811	8,599	9 202	8 659	9 176	517	6
MANAGEMENT AND ADMINISTRATION							
	4 882	5 058	5,271	4 959	5,142	183	4
Subtotal	24,410	26 621	28 489	26 806	28 408	1 602	6
CONTINGENCY			313	300	314	14	5
PRICE INCREASE					1 278	1 278	
Total Operations	24 410	26 621	28 802	27 106	30 000	2 894	11

TABLE 2 B

1991 BUDGET REQUEST BUDGET BY ACTIVITIES
 Amounts for Desirable Activities (1988 1989 1990 & 1991)
 (amounts are in thousands of current US dollars)

ACTIVITIES	Actual 1988	Actual 1989	1990 Budget		1991 Budget request	Changes over 1990 estimate	
			Approved	Estimate		\$'000	%
RESEARCH							
Natural Resources	39	67	76	127	126	(1)	(1)
Genetic Resources	46	191	95	158	151	(7)	(4)
Crop Improvement	311	553	473	702	675	(27)	(4)
Crop Production	83	152	188	275	267	(8)	(3)
Crop Protection	147	270	274	391	364	(27)	(7)
Livestock Production	162	249	200	282	283	1	0
Analysis	44	87	106	160	152	(8)	(5)
Utilization	5	10	12	27	25	(2)	(7)
Exploratory Res & Method Develop	56	144	153	254	245	(9)	(4)
Analysis of Impact	10	18	29	39	36	(3)	(8)
TOTAL RESEARCH	903	1 741	1 606	2 415	2 324	(91)	(4)
INSTITUTION BUILDING & NETWORKING							
Training	344	479	356	484	463	(21)	(4)
Conferences and Seminars	77	116	74	97	95	(2)	(2)
Documentation & Information	173	214	103	124	118	(6)	(5)
Counseling/Advising NARS	165	257	212	289	271	(18)	(6)
Technical Assistance	27	52	45	75	73	(2)	(3)
Network Coordination	117	195	165	240	230	(10)	(4)
TOTAL INSTIT BUILD & NETWORKING	903	1 313	955	1 309	1 250	(59)	(5)
MANAGEMENT AND ADMINISTRATION							
	320	538	452	655	630	(25)	(4)
Subtotal	2 126	3 592	3 013	4 379	4 204	(175)	(4)
CONTINGENCY			38	44	44		
PRICE INCREASE					189		
Total Operations	2 126	3 592	3 051	4 423	4 437	14	0

TABLE 3

1991 BUDGET REQUEST BUDGET BY CATEGORIES OF EXPENSES
 Amounts for Essential and Desirable Activities (1988 1989 1990 & 1991)
 (amounts are in thousands of current US dollars)

	Actual 1988	Actual 1989	1990 Budget		1991 Budget request	Changes over 1990 estimate	
			Approved	Estimate		\$'000	%
EXPENSES BY CATEGORIES							
ESSENTIAL							
Personnel	15 805	16 946	18 304	17 864	18 820	956	5
Training	1 451	1 641	1 630	1 237	1 298	61	5
Supplies and Services	4 891	4 847	5 061	4 702	5 046	344	7
Travel	1 682	2 237	2 339	1 983	2 187	204	10
Other	581	950	1 155	1 020	1 057	37	4
Subtotal	24 410	26 621	28 489	26 806	28 408	1 602	6
Contingency			313	300	314	14	5
Price Increase					1 278	1 278	
TOTAL ESSENTIAL	24 410	26 621	28 802	27 106	30 000	2 894	11
DESIRABLE							
Personnel	701	1 056	1,684	1 410	1 452	42	3
Training	168	334	247	860	772	(88)	(10)
Supplies and Services	285	589	442	481	487	6	1
Travel	465	909	220	413	413		
Other	507	704	360	1 215	1 080	(135)	(11)
Subtotal	2 126	3,592	2 953	4 379	4 204	(175)	(4)
Contingency			97	44	44		
Price Increase					189	189	
TOTAL DESIRABLE	2 126	3 592	3 050	4 423	4 437	14	0
HOSTED ACTIVITIES							
Personnel	316	371		405	405		
Training	159	187		172	162	(10)	(6)
Supplies and Services	183	215		245	235	(10)	(4)
Travel	144	169		178	172	(6)	(3)
Other	37	44		49	49		
Subtotal	839	986		1 049	1 023	(26)	(3)
Contingency							
Price Increase							
TOTAL HOSTED ACTIVITIES	839	986		1 049	1,023	(26)	(3)
TOTAL							
Personnel	16,822	18 373	19,988	19 679	20 677	998	5
Training	1 778	2 162	1 877	2 269	2 232	(37)	(2)
Supplies and Services	5 359	5 651	5 503	5 428	5 768	340	6
Travel	2 291	3 315	2 559	2 574	2 772	198	8
Other	1,125	1 698	1 515	2 284	2 186	(98)	(4)
Subtotal	27 375	31 199	31 442	32 234	33 635	1,401	4
Contingency			410	344	358	14	4
Price Increase					1 467	1 467	
GRAND TOTAL	27 375	31 199	31 852	32 578	35 460	2 882	9

TABLE 4 A

STAFFING PATTERN
Approved Positions for 1988 1989 & 1990 and Proposed Essential Positions for 1991

	Actual 1988	Actual 1989	1990 Budget		1991 Budget request	Changes over 1990 estimate	
			Approved	Estimate		No	%
1 INTERNATIONAL STAFF POSITIONS				*			
RESEARCH							
BEANS	20	21	23	23	22	1	(4)
CASSAVA	10	11	14	11	14	3	27
RICE	7	8	8	8	8		
TROPICAL PASTURES	17	17	18	18	19	1	6
Total Research Programs	54	57	63	60	63	3	5
RESEARCH SUPPORT							
GENETIC RESOURCES	1	1	1	1	1		
BIOTECHNOLOGY RESEARCH	1	1	2	2	3	1	50
VIROLOGY RESEARCH	1	2	2	2	2		
STATION OPERATIONS	1	1	1	1	1		
DATA SERVICES	1		1	1	1		
AGROECOLOGICAL STUDIES	1	1	2	1	2	1	100
SEEDS	2	2	2	2	2		
Total Research Support	8	8	11	10	12	2	20
TRAINING AND COMMUNICATION							
TRAINING AND CONFERENCES			1		1	1	
COMMUNICATION & INFORMATION	3	4	4	4	4		
Total Training & Communication	3	4	5	4	5	1	25
MANAGEMENT AND ADMINISTRATION							
OFFICE OF DIRECTOR GENERAL	2	2	2	2	2		
OFFICES OF DIRECTORS	3	3	3	3	3		
ADMINISTRATIVE SUPPORT	1	2	2	2	2		
PROJECTS OFFICE (**)	1	1	1	1	1		
Total Mgt and Administration	7	8	8	8	8		
TOTAL INTERNATIONAL STAFF	72	77	87	82	88	6	7
2 SUPERVISORY POSITIONS	268	303	307	310	311	1	
3 SUPPORT POSITIONS	1 168	1 209	1 220	1 208	1 241	33	3
Total Positions	1 508	1 589	1 614	1 600	1 640	40	3

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

** Paid from Indirect Cost Recovery

12/06/90

TABLE 4 B

STAFFING PATTERN

Approved Positions for 1988, 1989 & 1990 and Proposed Desirable Positions for 1991

	Actual 1988	Actual 1989	1 9 9 0 B u d g e t		1991 Budget request	Changes over 1990 estimate	
			Approved	Estimate		No	%
1 INTERNATIONAL STAFF POSITIONS							
RESEARCH							
BEANS	6	6	8	8	9	1	13
CASSAVA	2	2	3	3	4	1	33
RICE			2	2	2		
TROPICAL PASTURES			1	1	2	1	100
Total Research Programs	8	8	14	14	17	3	21
RESEARCH SUPPORT							
FARMER PARTICIPATION RESEARCH	1	1	1	1	1		
Total Research Support	1	1	1	1	1		
TOTAL INTERNATIONAL STAFF	9	9	15	15	18	3	20
2 SUPERVISORY POSITIONS	14	14	15	15	20	5	33
3 SUPPORT POSITIONS	25	25	27	27	32	5	19
Total Positions	48	48	57	57	70	13	23

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TABLE 5

1991 BUDGET REQUEST CAPITAL EXPENDITURES AND ASSETS
 Amounts for Essential and Desirable Activities (1988 1989 1990 & 1991)
 (amounts are in thousands of current US dollars)

	Actual 1988	Actual 1989	1990 Budget		1991 Budget request	Changes over 1990 estimate	
			Approved	Estimate		\$'000	%
EXPENDITURES							
New							
Research equipment	359	151	855	852	849	(3)	0
Operating equipment	403	23	93	282	309	27	10
Furnishings & office equipment	367	368	195	161	186	25	16
Vehicles	413	244	15	40	80	40	100
Aircraft							
Building & site improvements	562	941	594	570	300	(270)	(47)
Other							
Subtotal	2 104	1 727	1 752	1 905	1 724	(181)	(10)
Replacement							
Research equipment	77	231	359	348	325	(23)	(7)
Operating equipment	4	174	96	88	71	(17)	(19)
Furnishings & office equipment			77	100	80	(20)	(20)
Vehicles	311	387	360	320	300	(20)	(6)
Aircraft	1 253						
Building & site improvements							
Other							
Subtotal	1 645	792	892	856	776	(80)	(9)
TOTAL EXPENDITURES	3 749	2 519	2 644	2 761	2 500	(261)	(9)
CAPITAL STOCK							
Fixed Assets (beginning of year)	22,914	26 663	29 182	29 182	31,943	2,761	9
Additional Assets							
New	2 104	1 727	1,752	1 905	1 724	(181)	(10)
Replacement	1 645	792	892	856	776	(80)	(9)
YEAR END FIXED ASSETS	26 663	29 182	31 826	31 943	34 443	2 500	8

TABLE 6

1991 BUDGET REQUEST PRICE ASSUMPTIONS
 Amounts for Essential Activities
 (Percentage)

EXPENSES BY CATEGORIES	1989/1990 Net change	1991 Budget amount '000	Currency denomination		Inflation rate	Net price adjustment
				% Devaluation		
Personnel	4 50	8 366	US\$		5 0	5 0
	2 74	10 454	COL\$	28 0	32 8	3 8
Training	4 50	1 000	US\$		5 0	5 0
	4 50	298	COL\$	28 0	32 0	3 1
Supplies and Services	10 20	3 280	US\$		5 0	5 0
	2 11	1 766	COL\$	28 0	33 0	3 9
Travel	4 50	1 004	US\$		4 5	4 5
	7 56	1,183	COL\$	28 0	36 7	6 8
Other	5 00	814	US\$		4 5	4 5
	1 50	557	COL\$	28 0	30 0	1 6
TOTAL	4 00	28 722				4 5

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TABLE 7

1991 BUDGET REQUEST SOURCES AND APPLICATION OF FUNDS
 Amounts for Essential and Desirable Activities (1988 1989 1990 & 1991)
 (amounts are in thousands of current US dollars)

	Actual 1988	Actual 1989	1990 Budget		1991 Budget request	Changes over 1990 estimate	
			Approved	Estimate		\$'000	%
SOURCES OF FUNDS							
1 GRANTS							
For Essential Programs	25 778	28 421	30 616	28 100	31 956	3 856	14
For Desirable Programs	2 293	4 169	3 892	5 619	5 294	(325)	(6)
For Hosted Activities	839	1 017		1,049	1 023	(26)	(2)
2 OTHER INCOME							
For Essential Programs	935	840	700	816	716	(100)	(12)
For Desirable Programs	187	125					
For Hosted Activities							
TOTAL SOURCES	30 032	34 572	35 208	35 584	38 989	3 405	10
APPLICATION OF FUNDS							
1 OPERATIONS PROGRAMS							
Essential	24 410	26 621	28 802	27 106	30,000	2 894	11
Desirable	2,126	3 592	3 050	4 423	4 437	14	0
Hosted Activities	839	986		1,049	1,023	(26)	(2)
2 CAPITAL							
Essential	1,710	2 607	2 194	1 810	2 098	288	16
Desirable	354	702	827	827	856	29	4
Hosted Activities		31					
3 WORKING CAPITAL AND RESERVES							
Essential	593	33	320		574	574	
Desirable			15	369	1	(368)	(100)
TOTAL APPLICATIONS							
Essential	26,713	29 261	31 316	28 916	32 672	3,756	13
Desirable	2,480	4 294	3 892	5 619	5 294	(325)	(6)
Hosted Activities	839	1,017		1 049	1 023	(26)	(2)
TOTAL APPLICATIONS	30 032	34 572	35 208	35,584	38 989	3 405	10
MEMO ITEM							
WORKING CAPITAL AT YEAR END	832	1 525	1,860	1 569	2 157	588	37

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TABLE 8

1991 BUDGET REQUEST BALANCE SHEET
 Amounts for Essential and Desirable Activities (1988 1989 1990 & 1991)
 (amounts are in thousands of current US dollars)

	Actual 1988	Actual 1989	Estimate 1990	Projection for 1991
A S S E T S				
Cash & short term deposits	3 994	3 594	4 313	4 824
Accounts receivable	3 820	10,387	8 605	5 358
Inventories	1 701	1 459	1 208	1 005
Other assets	2 262	973	681	513
Property plant & equipment	26 663	29 182	31 943	34 443
TOTAL ASSETS	38 440	45 595	46 750	46 143
L I A B I L I T I E S & F U N D B A L A N C E S				
L I A B I L I T I E S				
Accounts payable	7,091	7 896	8 212	4 849
Payments in advance from donors	280	2 240	1 000	300
Other short term liabilities	1 469	1 363	1 327	1 370
Long term liabilities				
Staff reserves	634	1 279	1 479	1 579
Long term loans				
Other long term liabilities				
Subtotal Liabilities	9,474	12,778	12 018	8 098
FUND BALANCES				
Capital fund	26 663	29 182	31 943	34 443
Commitments for capital acquisitions	1 171	1,199	800	700
Working capital	832	1,525	1 539	2 152
Infrastructure fund		50	150	350
Capital development fund				
Reserve	300	300	300	400
Commitments for research equip		561		
Subtotal Fund Balances	28 966	32 817	34,732	38 045
TOTAL LIABILITIES & FUND BALANCES	38 440	45,595	46 750	46 143

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