CIAT

1982 - 1983

Program and Budget

and

Projections to

**Draft for consideration at
the meeting of the Board of Trustees,
26 - 27 May 1981**

CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL, CIAT

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Note: Figures given in this document are United States dollars - usually rounded to the nearest thousand. Actual expenses for 1980 are in 1980 dollars. Budget figures and projections are usually shown in constant 1981 dollars with inflation treated separately. Summary tables are presented in current dollars. Whenever possible column headings or footnotes indicate whether figures are in constant or current dollars as follows:

C$ = Current dollars of the year in question

81$ = Constant 1981 dollars.

28/ 4/ 81

STATEMENT OF OBJECTIVES

To generate and deliver, in collaboration with national institutions, improved technology which will contribute to increased production, productivity and quality of specific basic food commodities in the tropics - principally countries of Latin America and the Caribbean - thereby enabling producers and consumers, especially those with limited resources, to increase their purchasing power and improve their nutrition.

FEATURES OF THE OBJECTIVES STATEMENT

1. The product of CIAT's work is improved technology.

   While there are many other factors limiting production and productivity (for example - credit, markets, transportation, availability of purchased inputs, etc.) CIAT will concentrate its efforts on the generation and transfer of technology.

   The nature of this improved technology is characterized by the identitication of the beneficiaries as the producers and consumers, and especially those with limited resources, i.e. the rural and urban poor.

   Consumers with limited resources must be able to increase their purchasing power, therefore, the new technology must not be such as will increase production at any cost, but at lower unit costs. In addition, the commodities chosen for CIAT's activities must be those which are important parts of the diets of lower income consumers.

   Identification of the low resource producer (the small farmer) as a special target means that the technology must be biologically feasible, economically viable and socially acceptable under the real conditions of this group of producers. CIAT's minimum input philosophy is meant to ensure that resource-poor farmers will have access to the benefits of such technology.

   An intermediate product is implied, i.e. manpower trained in specific skills which will enable local institutions to adapt the product to specific local conditions and transfer it to the ultimate users.

2. The client for the product is identified as the national institution.

   This definition is made to dispel any misconceptions that CIAT has the responsibility or right to transfer technology directly to farmers. That function is a sovereign, national prerogative which cannot be usurped by an international institution. Moreover, the resources of an international center would not be adequate to work properly with individual farmers in its broad geographical area of responsibility.

The fact that the national institution is the client also implies that CIAT should play an active role in the delivery of the product to national agencies. This means that CIAT's responsibilities do not end at its gate but in the local institution, as mentioned above. The technology cannot really be considered appropriate until it has been validated at the farm level. CIAT must be involved in such trials but through its collaboration with national institutions.

3. The geographic scope of CIAT's activities is defined as the tropics, and specifically the tropics of Latin America.

In general terms tropics means the area between the Tropic of Capricorn and the Tropic of Cancer. This has different climates and altitudes but shares the common advantages and related problems of a year-round growing season (where water is available) due to the absence of frosts.

Specification of the Latin American tropics as a working area recognizes that CIAT is basically a Latin American organization, and has primary responsibility in the Western Hemisphere. The commodities it has selected to concentrate on were chosen because of their importance as basic foods in this region. Having decided to make a major effort on these commodities, global responsibilities have been assigned to CIAT - within the framework of the international center network - for two commodities, beans and cassava. Thus CIAT has responsibilities, and hopes to make an impact on production, for these products outside of the Latin American region; nevertheless, its principal commitment is to the American tropics.

4. The functional scope of CIAT's work is shown to be related to increases in production, productivity and quality of selected basic foods.

Increased production is to be through improved technology both to bring new land into production and to increase productivity per unit of land area, manpower and investment in existing production areas.

Quality factors are not to be ignored. Consumer acceptance must be ensured and improved nutritional objectives must be met.

Postharvest factors such as processing, storage, utilization and marketing are included in the functional scope only as required when they clearly impinge on the successful adoption of improved production technology.

5. Human welfare concerns as well as production goals are emphasized. Increased productivity is only a means to achieve the basic purpose of human well-being as measured by increased purchasing power and improved nutrition.

6. CIAT's product is not viewed as a panacea. Improved technology developed at CIAT is envisioned as only contributing to increased production while recognizing the importance of other institutions and factors.

THE 1982-83 BUDGET REQUEST

The budget proposed for 1982-83 amounts to C$43,077,000 for core operations, divided C$19,849,000 for 1982 and C$23,228,000 for 1983, and C$1,214,000 for capital(including working capital) divided C$602,000 for 1982 and C$612,000 for 1983. The budget includes 67 senior staff positions, an increase of 2 in 1982 and 2 in 1983. The following table gives a comparison of budgets for 1980-1983.

	1980-81				Proposed 1982-83					
	Actual 1980		Revised 1981		1982		%	1983		%
	Pos.	C$000	Pos.	C$000	Pos.	C$000	Incr.	Pos.	C$000	Incr.
Core operations	62	14361	63	17111	65	19849	16	67	23228	17
Capital		404		414		522	26		322	(38)
Working Capital		230		225		80	(2)		290	262
		14995		17750		20451	15		23840	17
Income		512		400		400	-		400	-
Net Requirements		14483		17350		20051	16		23440	17

* A separate paper is being presented by Management to propose changes in the 1981 budget to reduce the budget approved by the Board of Trustees in May 1980 to the level of funding which was expected after the meetings in Lima in July 1980. This reduced budget is referred to throughout this document as the "revised budget" and, since it is the base used for determining budget guideline figures for 1982 and 1983, is used for comparison with future budget figures.

The above table compares the actual expenses and budgets for each year in current dollars - i.e. including inflation between each of the years. This results in comparatively large apparent increases each year because inflation is high both for dollar expenses and for local peso expenses. However, if budgets are restated in constant terms the following real percentage increases result :

	Operations Budget 81$000 - 1981	% Increase
1981	17,111	
1982	17,609	2.9
1983	18,175	3.2

The following tables show the proposed changes, reductions and additions, in the budgets between 1981 and 1982 and 1982 and 1983. Explanations are given for each item in the paragraphs following the tables with each paragraph numbered to refer to the numbers given in the tables.

	Operations		Inflation	Budget Proposal			
		Costs	1981-82	Op. Costs	Capital	Work.Cap.	Total
	M-Y	81 $000	81$000	82$000	82$000	82$000	82$000
1981 BUDGET	62.5	17111		17111			17111
REDUCTIONS							
1) Biochemist position	(1.0)	(88)		(88)		(7)	(95)
TOTAL REDUCTIONS	(1.0)	(88)		(88)		(7)	(95)
ADDITIONS							
2) Inflation 1981-82			2213	2213	-	36	2249
3) Full year affect of Rice pos. added in 1981	0.5	40	5	45	-	4	49
4) Partial restoration of cuts made in 1980/81 :							
a) Program support		51	6	57	-	5	62
b) Train.& Conf.		153	20	173	-	14	187
5) New activities							
a) Beans-Path.Pos.	0.5	95	12	107	33	9	149
b) Rice-Econ.Pos.	0.5	89	12	101	30	8	139
c) Agroclimatology Position	1.0	115	15	130	16	11	157
6) Capital for existing activities					443		443
TOTAL ADDITIONS	2.5	543	2283	2826	522	87	3435
1982 BUDGET REQUEST	64.0	17566	2283	19849	522	80	20451

EXPLANATIONS

1982 Budget

1) Biochemist. The senior staff position of Biochemist has had responsibilities for the overall management of the routine soil and plant analytical services laboratories, the greenhouse service operations and as head of the Food and Nutrition Laboratory. It is considered possible to manage the laboratory and greenhouse services under a committee structure using quialified scientific and support staff.

With respect to food quality and nutritional research on CIAT commodities it is considered that CIAT has an ongoing responsibility to monitor the nutritional characteristics of the breeding lines being produced by the bean and cassava programs to ensure that appropriate standards are maintained. In addition, routine screening with respect to cooking and eating characteristics should be maintained in order that CIAT materials meet consumer preferences. Since the methodology has now been established, it is considered possible to continue this routine work under the supervision of qualified support staff.

Research on integrated dietary characteristics of CIAT products is carried on at INCAP in Guatemala in cooperation with CIAT and it is considered that CIAT does not have a sufficient comparative advantage in this area of work to give it high priority under severe budget constraints. Developed country institutions also have interest in this area of research and CIAT has and will continue to collaborate in these programs.

2) CIAT supplied information to the CG Secretariat on local inflation rates experienced in the past and projected for the future and the pattern of expenditures between local and foreign currencies. With this information and information obtained for the developed world from World Bank data, the Secretariat incorporated an inflation factor in developing CIAT's budget guideline figures for 1982 and 1983. The factor which has been used is 13% for both years. Although the figures used in arriving at the rate for Colombia are completely different from those we supplied to the Secretariat, we believe that the resultant inflation factor is probably not unreasonable. However, the 10% factor used for the developed World, in our case the United States, is we believe on the low side. The 13% inflation rate has been used in developing this budget proposal although later, when reviewing the budget at the start of each year, a more sophisticated analysis of the effects of inflation in each category of expense will have to be applied.

3) The 1981 budget, as revised, provides for an extra rice breader. Since the position and support costs will not be on stream for the full year in 1981, there will be extra costs in 1982 when a full year's expenses will be incurred.

4 a) The baseline figures used in calculation of the 1982-83 guidelines was the 1981 budget, which had already suffered a series of previous cuts, some of which we considered at the time to be temporary. The draft 1980-81 Program and Budget Proposal which was approved by the Executive Committee of CIAT's Board of Trustees in April, 1979, was already the result of an extremely detailed review of every program request, resulting in large reductions in the type of expansion of support which programs felt they needed in order to do their job most effectively. Nevertheless between the meeting of the Executive Committee and the meeting of the full Board of Trustees in 1979, at the request of the CGIAR Secretariat, further severe cuts in the support for program activities were made totalling $380,000 for operations and $192,000 for capital for 1980 and $401,000 for operations and $25,000 for capital in 1981. Obviously all of these custs cannot be restored in the 1982-83 budget: however, some restoration, in order to allow current program activities to operate at maximum efficiency, is considered to be of higher priority than initiating new activities. Details of the restorations or other increases are given in the budget changes section for each program or unit.

4 b) The budget reduction modules employed to reduce the CIAT 1981 budget to the revised allocation agreed to at Lima included a severe reduction in the funding for Training and Conference activities which was justified in the case of a temporary budget reduction; since it was considered to be more efficient and prudent to temporarily reduce the number of scholarships and conferences than to close down an individual program activity and then later start it up again. However, we consider training as one of the most important means of helping strengthen national programs and thus an important link in the technology generation process and therefore assured the TAC that if the funding shortfall indeed proved to be of a longer nature we would attempt to restore the major portion of the temporary reduction in resources for Training and Conferences. This is, therefore, shown as an important item in the change list.

5a) Diseases are the major constraint to increased bean production especially since small farmers are unable to afford the chemicals needed for control. Owing to limited resources, the Bean Program has only been able to concentrate on five major diseases. Work needs to be done on many other diseases in cooperation with the three breeders. It is proposed therefore to add a second pathologist. Detailed justifications for this addition have been sent to TAC and are given in the Bean Program commentary.

5b) The need for the addition of three positions in the Rice Program, i.e. breeder, economist and physiologist, to permit the expansion to work on upland rice has already been amply documented by CIAT and endorsed by the TAC. The breeder position has been added in 1981 and it is proposed to add the economist position in 1982 and the physiologist position in 1983. This is considered essential as a follow through to the TAC's decision to provide the additional funds for the breeder in 1981.

5c) The inclusion of an agro-ecosystems analysis capability was projected and briefly described in CIAT's 1980/81 Midterm Report. A detailed description of the activities and importance of this activity are given in the Data Services section later in this document (page 65). It is proposed that an agroclimatologist be added in 1982 followed by a land systems specialist in 1983.

6) The change table shows the total capital associated with each new program activity. In addition for existing ongoing activities there is a continual need for additional items of equipment. These, together with the needs of the new activities are detailed in the section on capital towards the end of this document (page 92).

	Operations		Inflation	Budget Proposal			
		Costs	1981-83	Op.Costs	Capital	Work.Cap.	Total
	M-Y	81 $000	81$000	83$000	83$000	83$000	83$000
1982 BUDGET REQUEST	64.0	17566		17566			17566
REDUCTIONS - None							
ADDITIONS							
1) Inflation 1981-83			4864	4864		225	5089
2) Full year effect of positions added in 1982	1.0	105	29	134		11	145
3) Partial restoration of cuts made in 1980/81							
a) Program support		233	64	297		24	321
b) Train.& Conf.		97	27	124		10	134
4) New activities							
a) Rice-Phys.Pos.	0.5	104	29	133	37	11	181
b) Syst.-Spec.Pos.	0.5	86	24	110	18	9	137
5) Capital for existing activities					267		267
TOTAL ADDITIONS	2.0	625	5037	5662	322	290	6274
1983 BUDGET REQUEST	66.0	18191	5037	23228	322	290	23840

EXPLANATIONS

1982 Budget

1) The comments in paragraph 2 on the 1982 budget have already explained the increase for inflation.

2) As noted it is proposed to add three senior staff positions in 1982. The increase noted here is for the extra cost in 1983 when all three positions will be on stream for the full year.

3a & b) The comments made in paragraphs 4a) and 4b) on the 1982 budget apply also to the 1983 budget.

4a) As noted earlier, the addition of a physiologist is proposed in 1983 to complete the expansion of the Rice Program to permit work on upland rice.

4b) The addition of a land systems specialist will complete the staffing in the Data Services Unit for the agro-ecosystems analysis capability.

5) As noted, capital requirements for ongoing activities are detailed in the section on capital.

PROJECTIONS

CIAT is preparing a long term plan for the eighties which proposes growth in most programs. The 1982/83 budget request has been prepared in parallel with the long term plan but, because of the reduced growth possible within the CGIAR guidelines, several new activities or positions could not be accommodated within the budget ceiling. Some of these positions have been included in a proposed supplemental budget list should extra funds become available for 1982/83. In addition, they are included in budget projections for 1984/85 along with other additional positions for those years. This results in the positions projected in this budget document being the same as those in the long term plan by the year 1985.

The projections, which are detailed in each program section and in the tables, include the following additional senior staff positions in 1984 and 1985:

		In long term plan from :
1984		
Beans	Regional Coop, C. America & Caribb.	1984
	Regional Coop., Eastern Africa	1983
	Regional Coop., Brazil	1984
Cassava	Virologist	1983
	Regional Coop., Asia	1982
Rice	Regional Coop., S. Andean	1984
Tropical Pastures	Forage Agron. H. Tropics	1982
1985		
Beans	Coordinator	1985
Cassava	Coordinator	1985
	Breeder - subtropics	1983
	Regional Coop., C.America, Caribbean and Mexico	1985
Tropical Pastures	Regional Coop., C.America & Caribbean	1985
Seeds	Seed Production Specialist	1985

The justifications for these positions are given in CIAT's long term plan but are repeated here for convenience and completeness.

1984

BEANS

Regional Cooperation, Central America & the Caribbean

This region, with its numerous small national bean programs and high per capita bean consumption, will probably continue to rely on the CIAT program during this decade. Transfer of germplasm and technology from CIAT and between national programs can best be served by stationing one scientist in the region. This position has been funded since 1977 via special funding, and twice has come close to interruption due to funding uncertainties.

Regional Cooperation, Eastern Africa

Eastern Africa is the second largest tropical bean production region, with per capita legume consumption much higher than in Latin America (in some countries over 50 kg per year). CIAT materials in the IBYAN program have proved to be well adapted to African conditions and the possibility exists for major gains from limited inputs despite the distance involved, and existing germplasm quarantine constraints. CIAT projects one outposted regional cooperation scientist for this region. Special project funding will be sought to support the initial phase of this activity. The scientist will be primarily responsible for the network collaboration, training, and regional coordination of germplasm activity and be expected to be the leader of a team which would be located in the region under special project funding probably in collaboration with FAO/UNDP.

Regional Cooperation, Brazil

With 55% of Latin American bean production in Brazil, and a strong national program, a closer collaboration between both research programs will be developed to ensure two way technology flow. Collaborative development of technology overcoming constraints to soil Al^{3} toxicity and low P in important bean production zones in Brazil will be emphasized. An outposted research scientist located in Brazil is projected who will work with Brazilian scientists as part of the national bean activities and also act in a liaison capacity with CIAT.

CASSAVA

Virologist

The viral diseases of cassava in the Americas were not previously considered as major constraints on yield. However, in the last few years two new diseases,

probably caused by virus infestation, have been identified and both have proved capable of causing complete crop failure. Intensive investigation of these diseases is under way. A program virology position is projected in order to advance this research.

Regional Cooperation, Asia

Approximately 40% of the total world cassava production is in Asia. Until quite recently the only country with a major national cassava program was India. Over the last five years national programs have developed in Thailand, Malaysia, Philippines, Indonesia and Sri Lanka. CIAT has been involved in supporting these programs through training, consultation and the provision of improved germplasm. CIAT has had a regional services position under special project funding in Asia which facilitated this work particularly in the introduction of germplasm and organization of training. The funds for this position have now ended and Asian national agencies have requested that CIAT once again station personnel in Asia to assist with coordination of activities in Asia and in germplasm development. From CIAT's point of view it is becoming progressively more difficult and expensive to provide the Asian national agencies with technical assistance from the Colombia headquarters. The two areas where these constraints are greatest are in coordination of training activities and maintaining an awareness of changing national needs, and in supplying countries with germplasm specifically adapted for Asian conditions. This latter situation is of great concern because at present the range of genetic variability in Asia is extremely limited. It is proposed that CIAT outpost one regional cooperation position in Asia who would form the stable base for a possible regional team which would be non-core funded.

RICE

Regional Cooperation, South Andean

The programmed expansion into upland rice will soon create a new demand for CIAT services. Some countries, i.e. those in the southern cone, have not adopted HYV technology for several reasons including specific production constraints not researchable at CIAT. For these reasons a strong case is building for consideration of some outposted staff activity. CIAT projects the placement of one outposted regional scientist to be located in a southern Andean country with responsibilities for coordination of collaborative research with CIAT.

TROPICAL PASTURES

Forage Agronomy, Humid Tropics

The humid tropics is an ecosystem which is experiencing an ever increasing immigration due to the combined effects of demographic, socio-economic, and geopolitical pressures. Most existing land use patterns result in rapid degradation of soil resources. The most prevalent exploitation system relies on the replacement of the original vegetation with pastures and crops. However, due to a lack of adapted forage species and the absence of a clear understanding of the dynamics of soil fertility levels after clearing, the productivity of the pastures tends to rapidly diminish due to loss of stand and weed invasion. Their useful life span is often no more than four to seven years. However, well managed, adapted legume-based pastures with minimum fertility maintenance are efficient at recycling nutrients and provide excellent erosion protection.

There is an urgent need for a broader range of adapted forage species and appropriate pasture development/management technology for these regions to contribute to ecologically sound and economically stable solutions. It is estimated that more than half of the 6-8 million hectares of cleared Amazonian forest is in a state of degradation. The recovery of the areas, already cleared, is one of the main objectives of this new thrust of the Tropical Pastures Program.

The Forage Agronomist will be the first of two outposted research scientists to be assigned to work with a research team of a collaborating institution, probably located in a "Seasonal forest" ecosystem. He will be responsible for germplasm screening and coordination of a series of regional trials within the two humid tropic ecosystems.

1985

Beans & Cassava Coordinators

For many years CIAT's largest program - the Tropical Pastures Program - has had a full time coordinator. For the other programs it has been possible, with some extra help on the research side, for selected scientists to undertake the dual roles of research scientist and program coordinator. The increased size of the Beans and Cassava Programs, combined with the added responsibilities for regional cooperation, means that part-time coordinators can no longer handle the work load. Relieving the coordinators from their disciplinary research responsibilities will give them more time to work closely with national programs for cooperative technology evaluation/transfer activities. Thus, the previously projected, inposted regional cooperation positions for the Northern Andean region have been eliminated.

CASSAVA

Breeder, Subtropics

Ecosystem 6 (the cool winter area) is an important cassava producing ecosystem in the Americas and in other regions of the world. Due to its location, CIAT at present cannot work in this area to provide basic germplasm to areas such as parts of Mexico, southern Brazil, Paraguay, Bolivia and the more northern islands of the Caribbean. It is proposed that one senior research scientist with research support be placed at a research institute, probably in Santa Catarina in southern Brazil, to first evaluate CIAT and local germplasm under these conditions and select adapted clones specifically for these conditions for further breeding. This material will then be made available to other countries where ecosystem 6 predominates.

Regional Cooperation, Central America, the Caribbean and Mexico

While the region is at present of less importance as a cassava producing area, many countries in the region are classified as caloric deficient. Cassava programs are only now being developed and require considerable assistance in planning and training during their formative years. In addition, for many years these areas will be directly dependent on CIAT developed germplasm. In most cases they will require finished varieties rather than sexual seed or large number of populations for selection. An outposted regional cooperation scientist is projected to provide support to the national agencies in the region.

TROPICAL PASTURES

Regional Cooperation, Central America and Caribbean

This staff member will respond to the needs of a region which includes no less than nine countries with nationally significant areas of acid, infertile soil employed essentially in beef production. Activities will relate to regional trial coordination, on-farm validation trials and inter-regional technology transfer.

SEEDS

Seed Production Specialist

In 1979 a special project funded by SDC(Swiss Development Cooperation) was started at CIAT with the basic objective of assisting in the strengthening of national seed related activities in the region and through this and the provision of seed production and processing facilities at CIAT decrease the delay time in new germplasm reaching the farm level.

The rationale for seed activities is based on the recognition of a large bottleneck which exists in developing countries in the transfer of germplasm based technology, namely the supply of high quality seed of the appropriate varieties as rapidly as possible to the end user.

The Seed Unit staffing at present consists of two senior scientists and supporting personnel provided entirely by the special project funding. Funding for present phase of the project will terminate in early 1984. In the first three years of the project the value of continuing seed related activities at CIAT has been clearly demonstrated. The response and collaboration being received from the countries in the region has been outstanding. The assistance being provided to the CIAT commodity programs has also been invaluable.

CIAT proposes to transfer one senior seed scientist now working in the Tropical Pastures Program to the Unit. In addition one senior core funded scientist position is projected for the Unit to commence in 1985.

SUPPLEMENTAL BUDGET

The budget request presented in this document conforms to guideline budget figures determined for the two years by the CG Secretariat. These figures allow for an increase of only 3% per annum in real terms - a very small margin for a center which has still to round out its research effort and has yet to include personnel for outreach activities.

It is possible that overall funding for the CGIAR funded system will be greater than that expected by the Secretariat in arriving at the guidelines or that those charged with deciding on the relative priorities of program components among Centers will permit more growth in some areas and will restrict growth in other areas. In either of these two events, information is needed on activities which centers consider of high priority but which cannot be included within the budget as constrained by the guidelines. The following list (in descending order of priority) with the justification of each item represents CIAT's supplemental budget request for the two years 1982-1983. It should be noted that the list is fairly small and does not even include all the additions previously projected and approved for 1982-83 or earlier.

	Additional Cost 1982 (82$000)				Additional Cost 1983 (83$000)			
	Oper.	Wk. Cap.	Cap.	Total	Oper.	Wk. Cap.	Cap.	Total
1. Forage Agron. H. Tropics, Trop. Pastures Program	76	6	33	115	139	11	5	155
2. Reg. Coop.-Asia Cassava Program	100	8	20	128	176	14	22	212
3. Breeder - Sub-tropics Cassava Program					113	9	37	159
4. Virologist - Cass. Program					134	11	37	182
5. Reg. Coop.- Africa Bean Program					86	7	22	115
	176	14	53	243	648	52	123	823

The justification and importance of these extra positions is given in the section on projections (pages 10- 15) where they are also included.

* FALL– BACK BUDGET

The CG Secretariat has asked centers to indicate a fall-back budget 5% less than the guidelines should funding be insufficient to meet the guideline totals and presumably to obtain an indication of the "cost" to center if funds are taken away to give to another. In preparing the 1982/83 budget request, CIAT has already assumed the elimination of the Biochemist position so that more new activities could be undertaken. Logically, therefore, CIAT's list of items that would be eliminated in a fall-back situation is made up mainly of the additional activities included in the 1982-83 budget since, being recent additions, they are of lower priority than the rest of the existing activities and also because it is far less painful and expensive not to start something than it is to discontinue an ongoing activity. The following list shows the savings which could be achieved to reach the fall-back position. The order which is that in which they would be eliminated, is tentative and could be changed by Management with subsequent Executive Committee approval.

	82$000
1982	
Guideline budget	20,451
New activities:	
Agroclimatology position	(157)
Beans - Pathology position	(149)
Rice - Economics position	(139)
Restoration of:	
Program support	(62)
Training & Conferences	(187)
Capital	(142)
Germplasm	(187)
	19,428

*1983	83$000
Guideline budget	23,840
New activities:	
Land Systems Spec. position	(137)
Rice Physiologist position	(181)

* This section is included in this draft but will be removed when the final version of the document is prepared and sent to the CG and TAC Secretariats separately.

	83$000
Restoration of:	
Program support	(321)
Training & Conferences	(134)
Germplasm	(211)
Capital	(50)
Delay hiring of vacant positions	(158)
	22,648

* Any delay in starting new activities in 1982 would have an effect on 1983 costs. It is assumed for this table that 1983 reductions are after 1982 has been fully funded.

The only items in the above lists which need a specific explanation are the ones for Germplasm. The proposal here, in the event of a severe shortfall in funding, would be to reduce the germplasm activities in the Genetic Resources Unit to a purely storage and maintenance operation i.e. no work would be done on the collection, evaluation, documentation and distribution of germplasm other than that needed for CIAT's own research needs. Naturally, the distribution of improved material, resulting from our research programs, would continue to be made to cooperating institutions for testing or release within client countries.

DIRECTOR FOR CROPS RESEARCH

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Director	1	1	1	1	1	1	1	1	-	-	-	-	6	6	1	1	1	1

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	147	139	93	(33)	94	1
Stipends	62	163	168	3	172	2
Supplies & Services	2	2	2	-	2	-
Travel	23	20	24	20	24	-
	234	324	287	(11)	292	2

* Except 1980 which is 80$.

BUDGET CHANGES

An administrative assistant and five support staff positions are eliminated as from 1982. Travel is increased to reflect the requirements for this position.

PROGRAM COMMENTARY

The objective of the Crops Research division is to develop improved plant material and associated low-cost production technologies in cassava, field beans and rice. The division is comprised of three major research programs (Bean Program, Cassava Program and Rice Program) plus a cluster of three research support units (Station Operations, Genetic Resources and Laboratory Services). The division is under the direct leadership of the Director for Crops Research who has overall responsibilities for all research activities in the division.

B E A N P R O G R A M

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERVISORY						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Research																		
Soil Microbiology	1	1	1	1	1	1	2	2	2	2	2	2	10	10	10	10	10	10.
Physiology	1	1	1	1	1	1	2	2	2	2	2	2	15	15	15	15	15	15
Breeding I	1	1	1	1	1	1	1	1	2	2	2	2	14.5	14.5	14.5	14.5	14.5	14.5
Breeding II	1	1	1	1	1	1	2	2	2	2	2	2	10.5	10.5	12.5	12.5	12.5	12.5
Breeding (Climb.Beans)	1	1	1	1	1	1	2	2	2	2.	2	2	12	12	13	13	13	13
Entomology	1	1	1	1	1	1	3	3	3	3.	3	3	31	28	29	29	29	29
Pathology I	1	1	1	1	1	1	2	2	2	2.	2	2	13	13	13	13	13	13
Pathology II			1	1	1	1			2	2.	2	2			12	12	12	12
Agronomy (Prel.Trials)	1	1	1	1	1	1	2	2.	2	2	2	2	10	10	11	11	11	11
Agronomy (Crop.Systems)	1	1	1	1	1	1	1	2	2	2	2	2	7	10	10	10	10	10
Agronomy (Int.Trials)	1	1	1	1	1	1	2	2	2	2	2	2	11	11	11	11	11	11
Virology	1	1	1	1	1	1	2	2	2	2	2	2	9	9	9	9	9	9
Economics	1	1	1	1	1	1	3	3	3	3	3	3	5	5	5	5	5	5.
Coordinator						1												
Total	12	12	13	13	13	14	24	25	28	28	28	28	148	148	165	165	165	165
Regional Cooperation																		
Central America & Caribb.					1	1											2	2
Africa					1	1											2	2
Brazil					1	1											2	2
Total					3	3											6	6

Direct Costs (81 $ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	1,262	1,559	1,622	4	1,685	4
Supplies & Services	126	149	164	10	164	-
Travel	133	127	145	14	145	-
Replacement Equipment	5	10	13	30	20	54
	1,526	1,845	1,944	5	2,014	4

* Except 1980 which is 80$.

BUDGET CHANGES

A second senior staff pathologist, with support staff and costs, is proposed starting in 1982. In addition four laborers are added in 1982 and a research assistant is substituted for a secretary. The laborers are required mainly for the extra work at the Popayan station.

PROGRAM COMMENTARY

Importance of Beans

Beans (Phaseolus vulgaris L.) are an important protein component of diets in many countries, especially for low income people. Bean production in the tropics is principally concentrated in Latin America (the center of the crop's origin), where, according to adjusted FAO estimates, 3.9 million tons are produced yearly (average for the period 1977 to 1979). Of this total, Brazil produces some 55 percent; Mexico, the second largest producer of beans in Latin America, produces some 15 percent. The second most important production region is Eastern Africa with an average yearly production of 1.4 million tons (1977 to 1979). Current estimates are that beans provide 11 percent of the protein consumption in Latin America, although in countries such as Brazil it is as high as 20 percent. In Africa, in countries such as Rwanda and Burundi, these figures are likely to be conservative estimates.

The common bean is generally a crop of the small farmer, produced in association with maize. In the general case, beans are produced with few purchased inputs; yields and profits are low. Over the last decade bean

production in Latin America has increased at the rate of approximately one percent/year. However, yields have declined. Currently, the predominant planting system of beans associated with maize averages around 600 Kg/ha. Hence, only area increases have enabled an increase in overall bean production. This production increase has not kept up with population increases. Thus, while Latin America is an exporter of beans (with Argentina being the principal exporter), bean imports to countries such as Cuba, Venezuela and Brazil continue to increase. The low production increase in Latin America, coupled with the fact that bean prices have increased greatly over the last decade, have led to a decreased per capita consumption in most countries (Peru, for example, has witnessed a decline of nearly 40 percent over the last decade).

The low profitability of bean production is due not only to low yields but also to extreme price fluctuations between seasons. These factors are increasingly leading to a displacement of beans by higher value crops, with bean production moving into more marginal, less fertile soils.

Problems of the Crop

Potential yields of current commercial varieties used in Latin America range from 2-3 t/ha. The principal reason why actual yields are only around 800 kg/ha (in monoculture) appears to be the heavy disease pressure on the crop. Commercial bean cultivars are susceptible to a wide range of diseases, each one of which can severely reduce yields. Disease incidence varies from region to region. Nevertheless, some diseases are prevalent in virtually all production regions e.g., 60 percent of bean production in Latin America is subjected to risk of anthracnose attack. Disease transmission via the seed has undoubtedly contributed to the wide distribution of anthracnose as well as many other bean diseases. Disease pressure is further increased by the poor plant type of bush beans. Plants commonly lodge at maturity, and with pods in contact with the soil disease accumulation in seed occurs. Rather than using clean, purchased seed, farmers traditionally save their seed for subsequent plantings, and thus are further contributing to disease incidence. Climbing beans which are excessively vigorous have podloads well above the ground, but are subject to seed loss when the maize lodges. Farmers have reacted to the strong disease pressure on beans by planting towards the end of the wet season. Consequently, in Colombia, for example, an estimated 60 percent of bean production is subject to drought stress.

Besides diseases, insects can cause severe reductions in bean production, particularly under the dryer conditions referred to above. With beans increasingly being displaced to marginal lands, soil acidity and phosphorus fixation become increasingly important. An additional important problem is that beans do not fix nitrogen under most production conditions.

The Bean Program is reasonably confident that the above summary of production problems reflect production reality. Nevertheless, additional knowledge of production methods, production systems and specific production constraints in given countries is continually being gathered as an important tool in refining the Program's research priorities.

Program Objectives

The Bean Program's objective is to develop, in collaboration with national programs, improved technologies that permit increased bean production and yields. The following primary activities support this principal objective.

1. Genetic improvement of bean germplasm that meets the agronomic requirements of farmers as well as consumer preferences.

2. Development of agronomic practices compatible with improved genotypes.

3. Training to strenghten the research and technology transfer and validation activities of collaborating national programs.

4. International cooperation at all levels for the further development of an active bean research network throughout the action area of the Program.

Program Strategies

Genetic improvement continues to constitute the principal strategy of the Bean Program to increase yields. Genetic improvement activities are based on the large genetic variability encountered in beans and are facilitated by the availability of 27,000 bean accessions in the CIAT germplasm facility. The Bean Program performs several thousand hybridizations per year. The resulting progenies pass through uniform successive nurseries in which all Program scientists participate. The best selections are tested in international uniform nurseries from which the national programs select materials for direct use in regional or for farm testing, or, alternatively, for use in their own breeding programs.

The Bean breeding activities strive to combine the following desired variability.

1. Resistance to priority diseases and insects. These are Bean Common Mosaic Virus (BCMV), Rust, Anthracnose, Angular Leaf Spot, Common Bacterial Blight, and Leafhoppers. When available resistance levels are inadequate, recurrent selection techniques are used. In addition, the Bean Program, through regional collaborative projects, attempts also to incorporate into improved varieties resistance to important location - specific diseases

(such as to Bean Golden Mosaic Virus in Central America). Of major importance in selecting improved varieties is the need to meet local color and seed size requirements by consumers. These requirements vary from country to country and from region to region.

2. Improvement of plant architecture, improved drought resistance, and increased yield potential of beans.

3. Decreased dependence on fertilizer requirements. While all lines are being developed and evaluated under low fertilizer and plant protection regimes, a genetically improved bean/Rhizobium interaction is sought to increase the nitrogen fixation ability of beans. Also, the bean program tries to enhance the genetic variability for efficiency in low soil phosphorus use - a principle production constraint in Brazil and Venezuela.

While genetic improvement for increased protein content, cooking time or digestibility is not actively being pursued, the Program does monitor these factors in newly developed materials to ensure that no deterioration occurs.

Since agronomic practices are largely site-specific, the Bean Program conducts little research in this area. There are indications, however, that improved varieties perform differently on the experiment station from the farmers' fields. Given that on-farm research and regional variety trials still are inadequately developed in most countries, the Program has found it necessary to devote considerable resources to validation trials.

Status of the Program

As a result of the high priority assigned to disease resistance breeding, all lines leaving CIAT are now resistant to BCMV, the most important virus disease of beans. Many of the lines developed for higher altitude regions where anthracnose is the main production constraint now are also resistant to this seed-transmitted disease. Sources of resistance to other diseases such as bacterial blight, rust and others, are available in improved lines, either alone or in combination with other disease resistances. Lines are available which are resistant to as many as four and even five diseases.

Advances in combining disease resistances have been accompanied by plant improvements in terms of stronger, more erect stems that resist lodging. At the same time, parent material has been identified for the development of lines that are tolerant to drought or to low soil phosphorus levels. Advances have also been made in combining disease resistances with other desirable characteristics in lines having commercial grain types.

As a result of the international yield testing program initiated in 1976, national programs currently have over 20 improved lines in regional or farm trials or in seed multiplication schemes. Varietal releases have already begun. For example, in Nicaragua, a promising CIAT breeding line, BAT 41, has officially been released as a new variety under the name "Revolución 79." Other releases include the so-called "Acacias - 4" in Honduras, and the varieties "ICTA Quetzal", "ICAT Jutiapa", and "ICTA Tamazulapa" in Guatemala. At the same time, Bolivia and Argentina are multiplying CIAT-improved black-seeded lines.

Availability of improved germplasm, combines with an ever-growing pool of CIAT trained bean professionals, have resulted in increased support to bean programs and bean research on the national level; the training and international cooperation activities of the Program have also contributed in no small measure to the development of the bean research network as it now exists in Latin America.

Following a conference held in 1980 in Malawi on the potentials for field beans in Eastern Africa, which was jointly organized by the University of Malawi and CIAT, increased collaboration is developing between CIAT and Eastern African countries. Improved germplasm from CIAT is now being tested in the region and Africal scientists are beginning to be trained at CIAT.

Expected Achievements

Now that the Program is well on its way to developing new germplasm that meets both producer and consumer requirements, it is facing the task of promoting both the multiplication of these materials, and the process of making them available on the farm level. The Program is confident that the quality of the new lines will assure that this challenge can be met.

At the same time, the Program will develop new lines with increased levels of currently available resistances, plus resistances to additional diseases. Levels of nitrogen fixation, tolerance to low soil phosphorus and to drought will be increased and will be combined with multiple disease resistance. Such factors will also become available in lines with snapbean characteristics. The distribution of this improved materials is expected to be achieved through the existing strong international bean network.

During the coming years, the Program, in collaboration with national programs, also expects to develop resistance to locally important diseases.

Despite the difficulties that are to be expected in transferring new technology to the multitude of small farmers in Latin America, the Program expects to be able to show increased levels of bean production in many of the collaborating

countries. For example, it is expected that by the end of 1983, Cuba will be planting some 40,000 ha to improved beans. In Bolivia, bean production with improved materials may exceed 10,000 ha. Nicaragua expects to plant 2,000 ha. in 1981 with improved lines, and plans to double this area in the following year. In Guatemala, the process of technology transfer to the small farmer is expected to continue and should soon result in increased bean production in that country. And in Brazil and Mexico CIAT - developed germplasm, plus material developed in collaboration with CIAT, are expected to be released as new varieties and should enter the phase of large-scale seed multiplication.

The above expectations are extrapolated from currently observed rates of progress in bean production. Of course, it is possible that in some countries unexpected production problems or other factors will impinge on the flow or germplasm movement. On the other hand, in selected countries the use of improved bean materials may advance more rapidly than expected. If supplemental funds were available to place one regional cooperation staff in Eastern Africa (starting in 1983), the Program expects to be able to mobilize and energize bean research efforts in the region and initiate the process of adapting improved bean technology to the regional conditions there. It is expected that through the efforts of the regional staff under consideration it will be possible to witness the first round of on-farm varietal testing by the end of 1983, to be followed by the release of new varieties by national institutions as early as 1984.

SPECIAL PROJECTS

Technical Cooperation Project for Central America and the Caribbean

The Swiss Government through SDC (Swiss Development Cooperation) has approved a three year project to station three senior staff in the Central America and Caribbean region. The objective of the project is to produce and disseminate improved bean technology to meet production constraints specific to the region. The project is undertaken in collaboration with the respective national bean programs in the region. The three man team consists of a coordinator, a plant breeder and a cropping systems agronomist. The resources provided by the project are as follows :

	1981	1982	1983
Personnel (Man-years)			
Senior staff	2.5	3.0	3.0
Support personnel	1.5	2.0	2.0
	C$	C$	C$
Costs			
Personnel	164,800	202,300	266,300
Research & Operational Expenses	31,000	42,000	46,000
Travel	17,500	24,000	26,000
Training	22,000	72,600	73,200
Vehicles	28,800		
Overhead	23,500	34,200	41,200
Total	287,600	375,100	452,700

Research and Technology Transfer for Peru

The Swiss Government through SDC has approved a four year project to station an agronomist in Peru to work on Beans. The objectives of the project are to support the National Bean Program in increasing bean production and to stimulate liaison with CIAT. The resources provided by the project are as follows:

	Year 1 1979/80	Year 2 1980/81	Year 3 1981/82	Year 4 1982/83
Personnel (Man-years)				
Agronomist	1.0	1.0	1.0	1.0
Costs	C$	C$	C$	C$
Personnel	57,600	52,700	58,500	80,300
Supplies & Services	8,500	9,500	11,000	12,300
Travel	9,300	10,300	11,500	12,700
Vehicle	8,000			
Overhead	11,300	10,900	12,200	15,800
Total	94,700	83,400	93,200	121,100

Regional Cooperation - Eastern Africa

The projections provide for a regional cooperation position in core from 1984. In the meantime special project funding is being sought for the initial phase of this activity. The scientist would be primarily responsible for the network collaboration, training and regional coordination of germplasm activity and be expected to be the leader of a team which would be located in the region under special project funding probably in collaboration with FAO/UNDP.

Gembloux Collaborative Project

A collaborative project betwen the University of Gembloux and CIAT has recently been renewed for a further three years starting in 1981. The project is for work in the areas of germplasm evaluation, flowering physiology and interspecific hybridization of a range of Phaseolus species. The project includes two FAO associate experts stationed at CIAT, with support personnel and other costs totalling about $35,000 per annum.

On-Farm Evaluation Project

Special project funding is being sought for a five year project to evaluate new bean technology in the context of farming systems on small farms in Latin America with particular emphasis on the Andean Zone. The project includes research, training, network activities and consultation. Resources required would include substantial inputs from the core funded cropping system agronomist and the economist plus project funds totalling in the region of $600,000 per annum for a sociologist, research and training personnel, stipends, supplies, conferences, consultants, vehicles, etc.

C A S S A V A P R O G R A M

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERVISORY						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Research																		
Utilization	1	1	1	1	1	1	2	2	2	2	2	2	9	9	9	9	9	9
Physiology	1	1	1	1	1	1	3	3	3	3	3	3	18	15	19	19	19	19
Breeding	1	1	1	1	1	1	2	2	2	2	2	2	33	33	33	33	33	33
Germplasm Development	1	1	1	1	1	1	2	2	2	2	2	2	11	11	11	11	11	11
Pathology	1	1	1	1	1	1	2	2	2	2	2	2	11	11	11	11	11	11
Entomology	1	1	1	1	1	1	2	2	2	2	2	2	14	14	14	14	14	14
Plant Nutrition	1	1	1	1	1	1	2	2	2	2	2	2	11	11	11	11	11	11
Cultural Practices	1	1	1	1	1	1	2	2	2	2	2	2	13	13	13	13	13	13
Regional Trials	1	1	1	1	1	1	2	2	2	2	2	2	12	12	12	12	12	12
Economics	1	1	1	1	1	1	3	3	3	3	3	3	5	5	4	4	4	4
Virology					1	1					2	2					11	11
Coordinator						1												
Breeding (Sub.Trop.)						1												9
Total	10	10	10	10	11	13	22	22	22	22	24	24	137	134	137	137	148	157
Regional Cooperation																		
Asia					1	1											9	9
Central Amer. & Caribbean						1												2
Total					1	2											9	11

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	1,306	1,453	1,484	2	1,488	-
Supplies & Services	110	122	112	(8)	112	-
Travel	112	106	120	13	120	-
Replacement Equipment	3	10	13	30	17	31
	1,531	1,691	1,729	2	1,737	-

* Except 1980 which is 80$.

BUDGET CHANGES

Three other support staff are added by reducing the level of several of the existing positions.

Services are reduced in 1982 to reflect real costs. Travel is increased in recognition of the extra costs for research in the jungle region of Colombia, regional trials and work in Asia.

PROGRAM COMMENTARY

Importance of Cassava

In 1980 world cassava production is estimated at approximately 120 million tons, produced on some 12 million hectares. The production is roughly divided as follows: 40% in Africa, and 30% each in Asia and the Americas. About 60 percent of the total production is destined for use as human food, half as fresh cassava and half after some form of processing. Fourteen percent is used as animal feed within the developing countries and an increasing amount is being exported as dried pellets for animal feed in the developed countries. Estimates vary for the amount of cassava lost as waste after harvest. However, the figure is somewhere between 13-25 percent, highlighting the importance of post harvest handling. In terms of direct human consumption cassava provides from 200-1000 cal per day for more than 700 million people in the developing countries.

Cassava is especially important for the poor because it is among the most inexpensive of foods available. In many countries dried cassava is by far

the cheapest form of obtaining calories while fresh cassava usually costs about the same as other major calorie sources such as corn or rice. Since the crucial nutritional deficiency in low income countries is calories cassava may be particularly important both because it is inexpensive and also because it is consumed primarily by the poor who are most vulnerable to calorie shortages.

Most cassava is produced by small farmers cultivating marginal soils, making it an important component of the diet among a major segment of the rural poor. Cassava consumption is lower in cities than in the country-side. This is the result of a complex interaction of a variety of factors, including: the perishability of cassava; poor transportation systems; relatively higher prices for cassava due either to subsidies for other foods or the heretofore rather slower pace of technological innovation caused by the historical neglect of the crop in terms of research and development. New technologies which raise the yields of cassava and reduce problems of storage may be expected to reverse current trends and induce an increase in urban consumption of cassava when coupled with elimination of subsidies for other foods and improvements in marketing and transportation systems.

Although cassava is relatively low in protein, it can also contribute to augmenting protein availability when it is used as an animal feed. Because of the availability of unused marginal land which can not support other crops but could produce cassava, the use of cassava as an animal feed could vastly reduce the competition between feed grains for the concentrate industry and the human food sector for calorie and protein sources. Moreover, domestic production of feed grains often has been unable to meet demand leading both to imports of feed grains by many countries that can ill afford it, and also to upward pressure on the price of animal feeds that tends to push up the cost of meat putting it out of reach of the very poor. Production of cassava with underutilized domestic resources could promote employment, alleviate the burden of costly imports, and contribute to maintaining a supply of cheap animal protein.

One particularly critical problem that has emerged for many low income countries in the last decade has been the difficulty of financing the import of petroleum in the face of dramatically rising prices. In Brazil, for example, a massive production campaign has been instigated to replace petroleum products with sugar alcohol. Unfortunately sugarcane requires high quality agricultural land and hence sugarcane production competes directly with food crops for use of agricultural land. Cassava is an attractive alternative as it can be produced on marginal land currently unexploited by the arable sector.

Problems of the Crop

Average yields of cassava of slightly less than 10 t/ha are far below the proven potential of the crop. The low yields are due to (1) poor agronomic

practices (2) lack of varieties responsive to improved low input management and (3) diseases and insects. Farmers also have little incentive to increase cassava production due to marketing problems faced if yields are dramatically increased. These marketing problems stem from two main factors. Firstly, although cassava is biologically one of the most efficient producers of energy from marginal soils with limited use of inputs it is also highly perishable. This perishability makes movement of local excess production both costly and risky. Secondly government policy often subsidizes the production or importation of cereal crops, thus often making cassava uncompetitive.

The problems of low yield on farmers fields and perishability can be attacked directly by improved production and storage and processing technology. Availability of such technology can then be used as an argument to force changes in government policy that presently work against increased cassava production.

Status of the Program

To the present, the Cassava Program has produced and tested thousands of hybrids, and high-yielding, disease and pest resistant lines have been obtained for further testing. Improved agroeconomic practices developed by the Program have been evaluated with the new clones in both regional trials and in on-farm evaluation trials. The net result of this work is best illustrated by the regional trials. With low input improved technology, average yields of local clones in Colombia was 20 t/ha (against a national average of 8.0 t/ha). These data illustrate the potential for the CIAT technology to double yield at selected locations without even changing varieties. The on-farm validation trials have shown that small farmers can readily increase their yields by as much as 70 percent using this technology.

In addition, the impact of the new selected clones and hybrids were able to boost yields to 30 t/ha in the regional trials. These clones still have problems, such as a slow multiplication rate and inferior eating quality. However, they do demonstrate the high yield potential that can be realized at the farm level by further research and development. New clones being produced by the program are rapidly overcoming some of the demonstrated deficiencies of earlier evaluated materials. A good example is the hybrid CM-342/170 which is of good agronomic and eating quality. Provisional results obtained in a very poor agricultural region show that this hybrid yielded 17-23 t/ha with improved technology, or some 70-130 percent more than the traditional, local variety used in this area (the latter also being produced under improved technology conditions). Such data suggest that a new high-yielding, high-quality variety will soon be a reality for even the poorest agricultural regions.

Objectives

The aim of the cassava program is to increase the production and utilization of cassava with particular emphasis on Latin America and Asia. Within this aim, the CIAT Cassava Program pursues the following objectives:

1. To develop germplasm and cultural practices based on low input levels and responsive to improved management, as a means to increase cassava production per hectare in areas where cassava is presently grown.

2. To develop germplasm and management practices, based on medium input levels to increase cassava production in the acid infertile soils of the lowland tropics.

3. To develop systems to reduce the perishability of cassava and allow more efficient use of cassava for either direct or indirect consumption by humans.

4. To strengthen national and local cassava programs so that they can effectively carry out their role.

These objectives should be viewed against two important points. Firstly, while CIAT places emphasis on Asia and America, IITA has direct reponsibility for Africa. Nevertheless, much of the technology developed by CIAT is applicable, either directly or with slight modifications, to African conditions. In the important case of intermediate-altitude cassava varieties (1000-2000 masl) for Eastern Africa, this is particularly the case. Secondly, in the lowland tropics there are some 1.7 billion hectares of acid infertile Oxisols and Ultisols that are at present mostly unproductive. Cassava is more tolerant of these conditions than most other species and the possibilities for increasing cassava production without replacing other crops are most significant.

Program Strategy

The production technology for cassava must be low cost so that the final product can be kept at a low price level. This precludes the use of such expensive inputs as continued chemical applications to control diseases and pests, irrigation to prevent drought, costly soil amendments to reduce pH and Aluminum levels in the soil, heavy use of high quality fertilizers, and other high cost, high energy use operations. This leads directly to the development of technology based on improved germplasm that overcomes many of the constraints on production. Other constraints can be minimized by management practices that include agronomic practices, biological control of insect pests, phytosanitary control of diseases, efficient techniques for fertilizer use, and other such practices.

Major constraints on production occur due to lack of high yielding varieties, drought and diseases and pests. Such constraints can, at least partially,

be removed by the development of improved germplasm. This has indeed been one of the major areas of emphasis of the Program in the past and will continue in the future. Cassava is grown in six major ecosystems. The Program will evaluate germplasm in each of these systems and use superior materials in crosses to produce clones specifically adapted to each ecosystem. The crosses produced will be evaluated first in advanced yield trials for yield stability and quality.

Breeding is used only for solving problems of major importance. Such problems as control of the myriad of pathogens that attack planting material are sought to be controlled through inexpensive chemical protectants. Other problems which cannot be resolved by breeding, are dealt with through other means. Thus, for example, no varietal resistance has been found to hornworm. In this case biological control methods are developed. In other cases such as phosphorous fertilization the most cost-effective methods are researched for and such techniques as use of rock phosphorous and mycorrhyza are developed. Improved management practices are developed for the advanced lines in each ecosystem and these are tested with the new improved lines for adaptability, within each ecosystem, through a series of regional trials. Based on these trials technology packages are recommended for use in a limited number of on-farm validation trials.

High starch content is an important factor in determining quality, and high starch lines are being bred. However, these lines are also likely to be highly perishable, as perishability of cassava is closely related to starch content. Cassava storage methods for the fresh market based on simple curing will be further developed. The market for dried cassava, either for use in bakery products or as animal feed, is increasing rapidly. However, one of the major limitations on cassava entering this market, is the development of highly efficient natural drying techniques, particularly in the more humid tropical areas. Such techniques will be developed by CIAT. A further factor militating against cassava entering the animal feed market is lack of good economic data on the potential performance of cassava in this market, as well as government policies that often subsidize other, often imported, competing products. The feed markets will be analyzed in certain areas and the feasibility of using cassava as an animal feed demonstrated. Policies that militate both for and agains its use will be clearly indicated. These studies will be made available to the private and public sector and, where interest is shown, the Cassava Program will cooperate in setting up demonstrative pilot projects.

Expected Achievements

By the end of the 1982-83 budget cycle, the Cassava Program expects to have available for testing by national programs several clones suitable for areas of the hot lowland tropics with a pronounced dry season. These clones will

possess high yield potential, moderate disease and pest resistance, moderate to high starch content, and a high degree of yield stability. It is expected that by 1985, the national programs will be in a position to release a selected few of these clones for commercial use in their respective countries.

At the same time (i.e., 1985) a large number of clones suitable for the acid savannas are expected to be in advanced testing. These clones will have moderate yield potential, a high degree of yield stability (conferred by very high levels of disease resistance), and will require minimal soil amendments to achieve moderate yields (i.e., 20-25 t/ha).

Large numbers of sexual seeds will have been given to national agencies, and it is expected that resultant selected clones will have been released by national agencies in such countries as Brazil, Mexico, Thailand, and Malaysia - countries that have strong national programs and have environmental conditions similar to those found in Colombia.

It is projected that adoption of improved cultural practices will have resulted in increased cassava production per hectare in substantial areas of Colombia, Brazil, Cuba and Mexico. Increased production not needed for human consumption in the form of fresh roots will be dried with the help of improved technology, to be utilized in balanced diets in animal feed rations, and - by the mid-to late 80s - as a partial wheat substitute.

Additional Achievements if Supplemental Budget is Approved

If a regional cooperation staff member can be placed in a suitable location in Asia starting in 1982, the process of disseminating CIAT technology in Asia can be greatly accelerated. It is expected that with this person in place there will be a rapid spread of new cassava clones with improved agronomic practices which, initially, will increase yields per hectare in India, Thailand and Malaysia. Presently unexploited lands in Indonesia and the Philippines will show a large increase in cassava area planted at moderate yield levels, and Sri Lanka will be expected to be able to raise yields from present low levels by the mid-to late 80s.

Also, with the addition, in 1983, of a virologist position, CIAT will be in a much better position to confront the cassava virus problems which are expected to become a major constraint to maintaining high levels of productivity by the mid-to late 80s.

Finally, through the placement in 1983 of a cassava research scientist (breeder) in a location in the cool winter areas, valuable time is gained to develop and evaluate new improved clones for the sub-tropical cassava growing areas of the Americas and Asia.

SPECIAL PROJECTS

Utilization

The core budget provides one senior staff scientist to carry out part of the research work on utilization and for coordinating visiting scientists, consultants and special projects which will handle certain specific areas of the research.

It is expected that several special projects will be undertaken over the next few years. At present discussions are being started with Fundación Polar (Venezuela) and TPI (Tropical Products Institute - UK) regarding possible funding of collaborative work.

Regional Cooperation - Latin America

An IDRC funded project which included funds for an outreach coordinator and training for Cassava in Latin America ended in 1980. A request has been made for a one year extension to the project to provide about $60,000 for training, a conference, travel and preparation of regional trial materials.

Regional Cooperation - Asia

An IDRC funded project which included funds for an outreach coordinator and training for Cassava in Asia ended in 1980. Efforts to obtain funding for a continuation of this activity have so far been unsuccessful.

RICE PROGRAM

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Research																		
Phys./Agron. (Upland)				1	1	1				2	2	2				13	13	13
Agron.(Irrig. Upland)	1	1	1	1	1	1	2	2	2	2	2	2	13	13	13	13	13	13
Breeding (Upl.)		1	1	1	1	1		2	2	2	2	2		14	14	14	14	14
Breeding (Irrig.)	1	1	1	1	1	1	2	3	3	3	3	3	17	16	16	16	16	16
Pathol. (Irrig. Upland)	1	1	1	1	1	1	2	2	2	2	2	2	14	14	14	14	14	14
Economics (Irrig. Upland)			1	1	1	1			2	2	2	2			6	6	6	6
Total	3	4	5	6	6	6	6	9	11	13	13	13	44	57	63	76	76	76
Regional Coop.																		
S. Andean					1	1											2	2

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	365	532	596	12	726	22
Supplies & Services	41	44	54	23	64	19
Travel	23	43	56	30	67	20
Replacement Equipment		5	7	40	10	43
	429	624	713	14	867	22

* Except 1980 which is 80$.

BUDGET CHANGES

It is proposed that a senior staff economist be added in 1982 and a physiologist in 1983 to complete expansion of the team so that work on upland rice can be undertaken. Extra travel funds are provided, over and above that for the new positions, because of the extra costs of travelling to Villavicencio where much of the work is carried on.

PROGRAM COMMENTARY

Importance of the Crop

Rice is one of the most widely cultivated crops in Latin America. Presently, there are 8.7 million hectares planted to rice in Latin America (two-thirds of which are in Brazil). Estimated total production is over 15 million tons per year. Rice represents a staple in the diets of the region's people. Estimates for annual per capita rice consumption are 9 kilograms in Mexico, 26 kilograms in Venezuela, 57 kilograms in Colombia, and 79 kilograms in Brazil.

In the past 15 years, rice production in the area has increased at an annual rate of 2.8 percent, equal to the population growth rate. In general, one-third of the increase in production can be attributed to increases in yields. The remaining two-thirds were due to increases in the area planted to rice. This proportion, however, has varied from country to country. In Colombia, Ecuador, Costa Rica, the Dominican Republic, Panama, Nicaragua, Haiti, and Trinidad-Tobago, production increases were mostly due to increases in yield. In contrast,

recorded production increases in Brazil, Peru, Argentina, Bolivia and Guatemala were mostly due to area increases.

Overall, gross rice imports to Latin America have increased from approximately 385,000 tons in the period 1963-65 to some 470,000 tons in 1973-75. As a result of increased exports from some countries, notably Colombia, Venezuela, Uruguay, and Surinam, net regional imports have remained at around 150,000 tons per year.

In recent years, high-yielding dwarf cultivars of rice grown under irrigated conditions have made significant contributions to increased productivity in Latin America, especially Colombia where dramatically increased yields could be achieved under conditions of good water control. However, since upland rice (i.e., rice grown on unbunded fields that are prepared and seeded under dry conditions and that depend only on rainfall for moisture) accounts for no less than 70 percent of the rice area grown in the region, the new achievements have had but limited impact on the majority of the rice cultivated in Latin America. Presently, upland rice yields an average of 1.5 tons per hectare (compared with about 3.9 tons for irrigated rice). Since upland rice accounts for 50 percent of total rice production in Latin America, even a modest improvement in upland yields will necessarily result in a rather dramatic production increase in the region.

Problems of the Crop

Three major areas of general production constraints to increased rice production in Latin America can be identified. Foremost are agronomic factors such as water control, land preparation, seeding methods, weed control, and fertilization. Today, the priorities in cultural practices are in the areas of technology transfer and location-specific agronomic research. The latter, of course, is primarily within the domain of national research institution responsibilities.

A second constraint to increased production is varietal improvement. Much has already been achieved in yield capacity of modern varieties; the challenges in varietal improvement are to close the gap between potential and actual yields (largely through improved farming practices with modern varieties) and to stabilize acceptably high actual yields. This is basically a problem of creating stable resistance to Pyricularia (rice blast disease), the only pathogen presently causing widespread losses. Added to yield loss are costs for chemical control, reduced prices for damaged grain and foregone yields wherever producers refrain from aiming at maximum productivity because of the threat of blast attacks. Failure to obtain stable resistance forces the release of new varieties every one or two years.

A third major production constraint includes the other pathogens and pests that are not as widespread as blast but, nevertheless, can be serious in specific areas. Most important are the fungal pathogens Rhyncosporium (leaf scald), Helminthosporium (brown leaf spot) and Corticum (sheath blight); and a range of insect pests (including Sogatodes oryzicola, the vector of the "hoja blanca" virus).

Upland rice production has an additional group of constraints that result from enviromental stresses. Plant types developed for the favorable irrigated conditions are not necessarily suitable for upland culture. Moreover, upland rice is often cultivated on marginal soils which are frequently characterized by low pH levels and high levels of aluminum. The relatively low water-holding capacity of the soil in the root zone of the rice plant creates severe drought stresses, even during relatively short dry periods. All of these stresses make the plant less tolerant to attacks from the pests and diseases mentioned earlier.

Objectives of the Program

The primary objective of the Rice Program is to develop and transfer improved varieties and production technologies to contribute to increased production, productivity and quality of rice in Latin America. In pursuit of this objective, the Program closely collaborates with the International Rice Research Institute (IRRI), whenever possible adapting its plant materials and technologies to specific needs of the region. The CIAT Rice Program also collaborates closely with the Rice Program of the Colombian Institute for Agriculture Research, (ICA).

Up to the present, CIAT has emphasized only lowland, irrigated rice. Beginning in 1981, it will also include upland rice as it is cultivated in the more favorable dry lands of Latin America. Work on upland rice is clearly indicated by a number of reasons, including the following:

1. The large proportion of rice production in Latin America which is currently under upland conditions.

2. The large amount of land available for expansion of rice production on upland conditions.

3. The large amount of capital investment required for expansion of irrigated rice production, even though large areas suitable for this type of rice culture are available in the region.

4. Most small farmers producing rice do so under upland conditions.

5. Rice technology developed for irrigated conditions has not proven very useful for upland rice culture.

6. National programs have not yet developed their research work on favored upland rice, nor their human and physical resources, to the point where they can produce exclusively, by themselves, the appropriate technology for upland rice production.

Strategies of the Program

A. Irrigated Rice

The Rice Program will continue its work in irrigated rice with the inputs of Breeding (one full senior staff position), Pathology (one-half senior staff position), and Agronomy/Training (one-half senior staff position).

The possibilities for further yield increases are being explored through the introduction of several widely adapted, high-yielding parents to the breeding program.

Stable resistance to rice blast disease (Pyricularia oryzae) has continued to dominate the breeding objectives of the Rice Program as this disease constrains rice production throughout Latin America. Pyramiding of major genes, incorporation of slow blasting characteristics (i.e., horizontal resistance), multilines, and accumulation of minor genes for resistance through crosses among susceptible varieties, constitute the major approaches to finding stable resistance.

Three new sources of resistance identified from sheath blight nurseries are being utilized to incorporate resistance into several promising lines and varieties. Similar efforts are carried out against leaf scald. Breeding for resistance to the plant hopper Sogatodes oryzicola, the primary vector of the "hoja blanca" virus, is also carried out as a high-priority activity.

B. Upland Rice

The Rice Program's emphasis on upland rice is on production systems for the more favored upland conditions. The "favorable" and "unfavorable" conditions are the two extremes in a continuum. Favorable upland rice may be defined as the dry-land rice grown on unbunded fields that are flat or gently sloping, with annual rainfall of 1,500 mm or more with at least 250 mm of monthly average rainfall in each of the growing months; in this environment moderately high yields are obtained in normal years. The CIAT Rice Program concentrates

its activities in developing upland rice technology for the more favored end of the continuum and is developing certain components of technology (e.g., better tolerance to water stress, more vigor for competition with weeds, etc.) which are useful in unfavored regions. It is expected that efforts in upland rice both at CIAT as well as in national programs will derive considerable benefits from the materials gathered on a worldwide basis for the upland nurseries of the International Rice Testing Program. All of these nurseries are supported by the large and gowing research program for upland rice at IRRI.

Starting in 1981 upland rice work is pursued with direct inputs from pathology, breeding, agronomy and agircultural economics.

Pathology - The budgeted senior staff pathologist devotes half of his time to upland rice. His responsibilities are to determine losses caused by, and the distribution of, various diseases under upland conditions. Those that are economically important are studied and control methods devised. It is envisaged that control can normally be achieved through varietal resistance; hence, major emphasis is placed on finding resistance and developing rapid screening methods.

Breeding - One full-time senior staff breeder is working on upland rice. His responsibility is to develop varieties that give high yields under upland conditions. In order to do this, sources of tolerance to diseases, insects, adverse soil conditions and limited levels of water stress are in the process of being identified. These sources are then used in a screening program to obtain varieties suitable for upland conditions.

Agronomy - The agronomy position supports both irrigated and upland rice efforts. Up to the present little agronomic work has been done on upland rice and it is likely that considersble increases in yields can be obtained by improved agronomic practices, particularly weed control. The agronomist is responsible for developing non-location-specific farming practices for upland rice. As new upland varieties are developed, new production technology may be required. The agronomy section develops this production technology and evaluates it with new varieties under varied conditions. The agronomist also assists national programs, through consultation, collaborative research and through training, in converting upland to irrigated rice production in areas where this can be done easily and economically.

Economics - A senior staff position is budgeted starting in 1982. The economist will first survey upland rice growing areas in climatic, edaphic and economic terms. Emphasis will be placed on determining in which areas improved upland rice may be more economically variable than irrigated rice so that technology can be developed for these areas.

C. Technology Transfer

Transfer of new technology to other countries is based on cooperation with national agencies through training, germplasm exchange, technical advice, and technical bulletins.

The training strategy is also integrated with research and outreach. Production courses will provide training on practical aspects according to the Program objectives. Most of the national programs are restrained from expanding their programs due to lack of trained personnel. It is proposed to train a few individuals at a time from each country in rice breeding and production. On completing their training they will become key professionals for transferring technology as well as strengthening their respective national programs.

Testing advanced breeding lines and superior varieties from several sources throughout the world is being done in an extensive system of cooperative trials and disease nurseries. These materials will be brought to CIAT for preliminary evaluation and screening and those suitable in terms of adaptation, yielding potential, grain quality and resistance to pests and diseases will be selected to multiply seed and to make up specific nurseries for the International Rice Testing Program for Latin America. This work is coordinated by the IRRI/CIAT liaison scientist, who is a member of the IRRI staff working as an integral component of the CIAT Rice Program.

Availability of good quality seed of promising lines and varieties is an essential prerequisite for their wide evaluation. CIAT conducts a large seed multiplication project of new improved varieties primarily to provide nucleus materials for national programs.

Status of the Program

The CIAT Rice Program - in collaboration with the national Colombian research institution, ICA - has made available to countries in Latin America eight finished dwarf lines with high yield potential which have been released by these countries under a total of 29 names. An additional 12 varieties were released by collaborating national programs on the basis of selections from advanced CIAT breeding lines. These varieties considered together are grown on about 1.5 million hectares annually in irrigated and favored upland sectors. The introduction of these new varieties, together with the improved cultural practices, have been associated with one to two tons of additional rice per hectare.

CIAT has trained more than 200 rice researchers from 23 countries in the areas of production, agronomy, breeding, and pathology. Thus, an effective

regional network of collaborators exists for the continuing interchange and evaluation of technology and information. The Rice Program has continued to emphasize regional activities including International Rice Testing Program (IRTP) nurseries, monitoring tours, production courses within countries, and biannual conferences for rice researchers. These activities have greatly contributed to the further strengthening of the Latin American rice network.

SPECIAL PROJECT

Blast Resistance Project

In mid 1980 the Rockefeller Foundation assigned one of their scientific staff to do research on developing new genetic strategies for blast resistance in rice. In addition to all personnel costs for the scientist, the Foundation provides $17,000 for research expenses.

GENETIC RESOURCES UNIT

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Germplasm Processing	1	1	1	1	1	1	4	4	3	3	4	4	16	16	16	16	16	16
Tissue Culture	1	1	1	1	1	1	2	2	2	2	2	2	5	5	7	7	7	7
Total	2	2	2	2	2	2	6	6	5	5	6	6	21	21	23	23	23	23

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	227	277	277	-	277	-
Supplies & Services	21	30	30	-	30	-
Travel	12	18	17	(5)	17	-
Replacement Equipment	-	1	2	100	3	50
	260	326	326	-	327	-

* Except 1980 which is 80$.

BUDGET CHANGES

It is proposed that an assistant be eliminated in the germplasm processing section and two laborers substituted so as to adjust the work - force to requirements.

PROGRAM COMMENTARY

The objectives of the Genetic Resources Unit in CIAT are to collect, evaluate, maintain, document and distribute the germplasm of Phaseolus beans, tropical pastures and cassava in support of the crop improvement programs. These activities are designed to allow for the full utilization of the valuable genetic resources and at the same time to make provisions for their conservation. The above germplasm management activities cover the 30,000 accessions of Phaseolus beans (of which 27,000 belong to P. vulgaris), 2,400 accessions of cassava, and 7,250 accessions of tropical pastures.

Both the Phaseolus beans and the tropical pastures germplasm are maintained in the form of true seeds. The Genetic Resources Building provides facilities for seed storage under optimal conditions with three cold rooms. One cold room of 180 m^3 is maintained at 10°C for short-term storage of beans and tropical pasture germplasm, while the other two (40 m^3 and 33 m^3, respectively) are maintained at - 15°C and 0°C, respectively, for long-term storage. A glasshouse was added to the Genetic Resources Unit in 1979. The cassava germplasm is presently maintained in the form of a living collection in the field. Meristem tissue culture techniques have been successfully developed for various cassava clones. A replicate collection of the cassava germplasm for storage as aseptic meristem cultures is now being assembled. A storage room of 30 m^3, maintained at 22°C and with light intensity at 1500 lux, provides storage space for the 2,400 accessions of cassava clones in the form of meristem cultures.

Field collection activities have been arranged with the national programs in Mexico, Brazil, Peru and Guatemala to obtain Phaseolus materials which are poorly represented in the germplasm bank. CIAT maintains the world collection of Phaseolus germplasm which includes P. vulgaris, P. lunatus, P. coccineus, P. acutifolius and the wild Phaseolus species. These materials are being evaluated for 32 standard descriptors plus data on collection sites, disease resistance, environmental adaptation, etc. The information collected is fed into a system of computerized data management which permits efficient filing and rapid retrieval, at the same time that it lends itself to statistical analyses. To assist in the distribution and utilization of these genetic materials catalogues are published at regular intervals. In addition, the quality of the seeds has been improved to reduce such factors as seed borne diseases, low viability, etc., thereby making the seed suitable for distribution and conservation purposes.

Evaluation procedures and data management systems similar to those for beans are now being developed for CIAT's collections of cassava and tropical pastures germplasms, in close collaboration with the respective programs. It is hoped that through this expansion of the Unit's activities, the needs of the research programs for well characterized germplasm can be met. For the present, the seed increase and distribution of tropical pasture germplasm, and the application of the tissue culture techniques for the cassava germplasm, form the two main ongoing activities in the respective commodities.

LABORATORY SERVICES UNIT

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	B 8
Food Qual. & Nutr.	1	1					1	1	1	1	1	1	3	3	1	1	1	
Laboratories							2	2	2	2	2	2	16	16	17	17	17	17
Greenhouses							1	1	1	1	1	1	3	3	3	3	3	3
Total	1	1					4	4	4	4	4	4	22	22	21	21	21	21

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	222	264	189	(28)	189	-
Supplies & Services	54	60	63	5	63	-
Travel	2	8	1	(87)	1	-
Replacement Equipment	59	30	40	33	50	25
	337	362	293	(19)	303	3

* Except 1980 which is 80$.

BUDGET CHANGES

As described earlier, it is proposed that the senior staff biochemist position be eliminated starting in 1982. Reductions in the budget are for the personnel costs of the senior staff and secretarial positions partly offset by upgrading one support staff position to manage the laboratories. Travel is also reduced with the senior staff position.

The routine activities of quality evaluation and consumer acceptance will continue in the Food Quality and Nutrition Laboratory, but research into the underlying basis of quality will cease. Important problems such as hard seed coat in beans and textural changes in cassava were thoroughly investigated in 1980-81.

PROGRAM COMMENTARY

The Laboratory Services Unit provides support to CIAT's commodity programs through the following activities:

1. Analysis - primarily chemical - of soil, water and plant tissue samples submitted by program scientists for purposes of agronomic management and fertilizer recommendations.

2. Maintenance and repair of all CIAT laboratory instruments and laboratory equipment.

3. Operation of a special washing and sterilization facility for glassware.

4. Maintenance of colonies of small animals (rabbits, mice and rats).

By late 1980 CIAT's plant growth facilities were fully developed, with six 10 m x 40 m glass houses in operation, plus 8 plant growth rooms with control of light, temperature and humidity. Extensive mesh houses (with over 3000 m^2 total area) were also in use. No expansion of these excellent facilities is expected during the 1982-83 budget period.

STATION OPERATIONS UNIT

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	B
Farm Super.	1	1	1	1	1	1	3	3	4	4	4	4	88	88	85	85	85	

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	414	486	486	-	486	-
Supplies & Services	174	197	197	-	197	-
Travel	4	4	4	-	4	-
Replacement Equipment	41	50	100	100	120	20
	633	737	787	7	807	3

* Except 1980 which is 80$.

BUDGET CHANGES

A research assistant position is added to manage the Popayan Station in substitution for a reduction of three other support staff positions.

PROGRAM COMMENTARY

The Station Operations Unit supports research programs in land preparation, planting, weeding, irrigation and harvesting at three sites: Palmira, Santander de Quilichao and Popayan. For this the unit operates and maintains the farm machinery and earth moving equipment; develops and maintains irrigation and drainage ditches, roads and fences.

In 1980 a major effort was made to reduce labor requirements by mechanization and by improvements in irrigation systems, including gated pipe. Also in 1980 the Popayan Station was developed for Bean and Cassava research work.

Plans for the future include further mechanization and the installation of covered irrigation ditches to reduce water losses.

The unit is also responsible for the production of seeds and commercial crops on land not needed for research work.

DIRECTOR FOR LAND RESOURCES RESEARCH

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Director	1	1	1	1	1	1	1	1	1	1	1	1	6	6	1	1	1	1

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	147	140	114	(19)	115	1
Stipends	44	113	108	(4)	104	(4)
Supplies & Services	1	1	1	-	1	-
Travel	15	17	20	18	20	-
	207	271	243	(10)	240	(1)

* Except 1980 which is 80$.

BUDGET CHANGES

Five other support staff positions are eliminated as from 1982. Travel is increased to reflect the requirements for this position.

PROGRAM COMMENTARY

Tropical and subtropical America has nearly one billion hectares of significantly underutilized savannas and forests, 75 percent of which are composed of acid, infertile soils (i.e., Oxisols and Ultisols). These areas have a large agricultural potential since they have abundant solar radiation with adequate rainfall and favorable temperature regimes for extended growing seasons. Topography and soil physical properties are also generally favorable. Through its Land Resources Division, CIAT recognizes this distinct and promising feature of tropical America. It aims to contribute to the broadening of the resources base of Latin American agriculture through a low-cost input approach based on the selection of germplasm material that is most adapted to those edaphic conditions. Thereby, CIAT expects to contribute to the development of ecologically sound, stable and productive agricultural production systems for these areas.

The division of Land Resources Research is comprised of two research entities, viz., the Tropical Pastures Program, and Special Studies. Two research support units (i.e., Data Services and the Agro-ecosystems Analysis Units) are also attached to this division.

TROPICAL PASTURES PROGRAM

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERVISORY						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Research																		
Coordinator	1	1	1	1	1	1	1	1	1	1	1	1	.5	5	2.5	2.5	2.5	2.5
Germplasm Evaluation :																		
Germplasm Evaluation	1	1	1	1	1	1	2	2	2	2	2	2	12.5	12	13	13	13	13
Agronomy (Carimagua)	1	1	1	1	1	1	2	2	2	2	2	2	14	14	13	13	13	13
Forage Agronomy (Brazil)	1	1	1	1	1	1							1	1	1	1	1	1
Regional Trials	1	1	1	1	1	1	2	2	3	3	3	3	8.5	8.5	8.5	8.5	8.5	8.5
Plant Pathology	1	1	1	1	1	1	2	2	2	2	2	2	12.5	11.5	10.5	10.5	10.5	10.5
Plant Entomology	1	1	1	1	1	1	2	2	2	2	2	2	11.5	11.5	11.5	11.5	11.5	11.5
Soil Microbiology	1	1	1	1	1	1	1.5	1.5	2	2	2	2	9.5	9.5	9.5	9.5	9.5	9.5
Forage Agronomy/Breeding	1	1	1	1	1	1	1.5	1.5	2.5	2.5	2.5	2.5	8.5	8.5	9.5	9.5	9.5	9.5
Legume Breeding	1	1	1	1	1	1	2.5	2.5	1.5	1.5	1.5	1.5	10.5	9.5	9.5	9.5	9.5	9.5
Pasture Evaluation :																		
Seed Production	1	1	1	1	1	1	3	3	3	3	3	3	19.5	19.5	19.5	19.5	19.5	19.5
Soil/Plant Nutrition	1	1	1	1	1	1	2.5	2.5	2	2	2	2	15.5	15.5	15.5	15.5	15.5	15.5
Plasture Development (Carimagua)	1	1	1	1	1	1	2	2	2	2	2	2	10	10	10	10	10	10
Posture Develop. (Brazil)	1	1	1	1	1	1							1.5	2	2	2	2	2
Posture Quality & Nutrit.	1	1	1	1	1	1	2	2	1	1	1	1	9	8	12.5	12.5	12.5	12.5
Posture Evaluation	1	1	1	1	1	1	2	2	2	2	2	2	15.5	15.5	9.5	9.5	9.5	9.5
Pasture Evaluation in Farm Systems :																		
Cattle Prod. Systems	1	1	1	1	1	1	2	2	2	2	2	2	10.5	9.5	10	10	10	10
Cattle Production (Brazil)	1	1	1	1	1	1							1					
Animal Health	1	1	1	1	1	1	3	3	3	3	3	3	13	13	11.5	11.5	11.5	11.5
Economics	1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3
Forage Agron.(H.Tropics)					1	1											2	2
Total	20	20	20	20	21	21	36	36	36	36	36	36	192	187	182	182	184	184
Regional Cooperation																		
Central America & Caribbean								1										2

Direct Costs (81$ thousands*)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	1,935	2,389	2,266	(5)	2,275	-
Supplies & Services	247	220	243	10	243	-
Travel	285	241	243	1	243	-
Replacement Equipment	7	15	20	33	25	25
	2,474	2,865	2,772	(3)	2,786	1

* Except 1980 which is 80$.

BUDGET CHANGES

The program has reduced by two clerical and three other support staff between 1981 and 1982. Supplies and services are increased because of the extra costs of operating at Carimagua.

PROGRAM COMMENTARY

Importance of the Program's Products

The Tropical Pastures Program has four major products: beef, milk, conservation of tropical ecosystems, and resource base expansion. A short summary of the importance of these products follows.

1. Beef. Beef is one of the staple foods of Latin American urban and rural poor, and one of the principal reasons why protein malnutrition is less acute in tropical America than in Africa or Asia. During the last 15 years the annual growth in demand for beef in tropical America (5.6 percent) has exceeded increases in production (3.6 percent). This gap is resulting in real price increases which will cause a decrease in beef consumption by families of the lower 25 percent income strata which presently use from 8 to 16 percent of their total budget to buy beef. The high price elasticities of demand for beef also suggest that increases in beef production leading to lower real prices would have a larger impact on consumption and quality of diet than production increases for any other major staple food crop consumed by the Latin American poor.

In order to accomplish this, production costs, particularly social costs, must be reduced and this is more likely possible in the acid, infertile soil areas because of their present low opportunity costs.

2. Milk. The situation with milk production trends in tropical America is similar to that of beef with low per capita production (one-quarter that of the U.S.), and imports of milk and by-products tripling in the last 10 years. The Program's target area survey has shown that milk production from beef cattle farms is an important source of income in many areas and that its importance increases with decreasing farm size.

3. Conserving tropical ecosystems. The Oxisol/Ultisol savanna and cerrado regions of tropical Latin America, covering 300 million hectares, are no longer only "potential" areas of expansion. As new roads are built, development is taking place at an ever-increasing rate. Much of this development occurs without appropriate soil management technology, resulting in land abandonment, soil erosion, and the conversion of land into unproductive pastures. Extensive, pasture-based beef production is the most widespread land use in the region, and, if properly managed, one of the most ecologically sound. Well-managed, productive and persistent grass/legume pastures not only provide excellent protection against soil erosion but improve soil fertility because of nitrogen fixation and nutrient recycling by plants and the grazing animal. On the other hand, poorly managed pastures can be disastrous, especially on more sloping sites.

4. Expanding the land resources base. In addition to its ecological implications, pasture-based beef production can serve as a catalyst for settling the Oxisol/Ultisol regions, primarily because the initial infrastructure investment is much lower than for crop production. The development of well-managed pastures increases the value of the land. When roads provide improved access to markets, it becomes more profitable to devote part of the land to crop production, with beef gradually moving to new settlement areas. Also, intercropping pastures with annual or perennial crops is feasible. Therefore, beef can serve as a wedge to develop this important resource base and open the way for integrated agriculture development. Furthermore, increases in beef production in Oxisol/Ultisol regions permit alternative uses of better soils located closer to markets which should be used for more intensive crop production.

Program Objectives

The objective of the Tropical Pastures Program is to develop and transfer, together with national institutions, improved, low-input pasture technology

in the acid, infertile soils of tropical America, in order to increase beef and milk production, conserve and improve soil resources of tropical ecosystems, and provide a basis for an economically and ecologically sound utilization of underexploited land resources in tropical America.

Program Strategies

The research team of the Program is organized into three functional units: (a) Germplasm evaluation (including the sections on germplasm, agronomy, plant pathology, entomology, and breeding); (b) Pasture evaluation (including the sections on seed production, pasture development, pasture quality and nutrition, and pasture evaluation and management); and (c) Pasture evaluation in production systems (including the sections on cattle production systems, animal management, and animal health). These three units assure a dynamic flow of germplasm in which screening by ecosystems, characterization of germplasm, assembly of approrpiate pasture production technology, and economic evaluation of new pasture technology in farm systems, constitute major research steps. While thousands of germplasm entries are worked with in the initial phases of the flow of germplasm through the Program activities, only very few highly promising germplasm materials succeed in being selected for the assembly of pasture technologies and further evaluation.

The Program attempts to exploit the natural variability of germplasm to identify grass and legume species adapted to the various ecosystems in the region. Accordingly, germplasm is assembled from a wide range of conditions throughout the acid, infertile soil regions of tropical America as well as selected areas in Asia. Presently, the CIAT germplasm bank contains some 7000 accessions. This germplasm is screened for tolerance to high soil aluminum and acidity, low phosphorus availability, and tolerance to diseases and insects. Ecotypes which pass this first screening are characterized in terms of tolerance to drought, flooding, burning, etc. and also in terms of minimum nutrient requirements, nutritive value, and tolerance to grazing, and compatibility in grass/legume mixtures. Subsequently, pastures based on highly promising ecotypes are assembled, relevant establishment technology is developed, and cattle live-weight gains are measured. The most promising pasture combinations are subjected to a long-term evaluation, and the respective technology packages are further adapted to the requirements of the predominant farm systems in the area. Also, the improved technology is evaluated in economic terms.

This entire research process is carried out in close collaboration with national institutions throughout the area of interest.

To date, the principal emphasis has been placed on the two savanna ecosystems known as "llanos" and "cerrados". Research for the "llanos"

ecosystem is carried out in the Carimagua research station which is jointly administered by the Colombian national research institute (ICA) and CIAT. Research for the "cerrado" ecosystem is carried out in collaboration with the Brazilian agricultural research center for the cerrado region (CPAC) - a station of EMBRAPA. Also, a regional trial network has been assembled in cooperation with national institutions, to evaluate promising germplasm in sites which represent sub-ecosystems both in the "llanos" and the "cerrado" region. The network also encompasses additional ecosystems, viz., the poorly drained savanna, seasonal forests, and rain forest. This allows the Program, in collaboration with national organizations, to test germplasm throughout the area of interest and to evaluate the degree of adaptation of promising germplasm to the different ecosystems and sub-ecoystems in the lowlands of tropical America. The information obtained through this evaluation network is recorded in computerized data banks which allows for effective analyses of germplasm performance across locations.

Status of the Program

The Program has developed an inventory of land resources in the area of interest, with edaphic, topographic and climatic characterizations of the region organized in a systematic and easily retrievable manner. The Program also has assembled a germplasm bank consisting of more than 7000 accessions. This germplasm pool is complemented by a parallel collection of Rhizobium. Furthermore, the Program has progressed to the stage where several genera and species have already been identified as being well adapted to the conditions of one or more of the ecosystems of interest. These genera and species include Andropogon gayanus, Brachiaria spp., Stylosanthes spp., Desomodium ovalifolium, Pueraria phaseoloides, Zornia spp., and Centrosema spp.

The potential productivity of a large number of pasture grazing alternatives in the "llanos" ecosystem has been determined. Various grass/legume associations in controlled grazing, low input experiments have produced annual live weight gains per animal of more than 200 kg. On a per hectare basis same associations have produced more than 300 kg/year.

The highly promising grass A. gayanus CIAT 621 has been further evaluated and has recently been released by Colombia and Brazil. Both of these countries have been delivered large amounts of basic seed.

Expected Results

The Tropical Pastures Program is well on its way to developing, in collaboration with national institutions, pasture production technology that has the potential to transform the pioneer animal production system in the vast frontier

of tropical Latin America. To date, available research results reconfirm the soundness of the Program's strategy to develop legume-based pasture technology that rests on germplasm adapted to specific ecosystems. After the very successful release of A. gayanus by Colombia and Brazil (soon to be followed by Venezuela and Panama), the Tropical Pastures Program will soon finish the compilation of the information which is required to assure the successful release of one or more legumes for the "llanos" ecosystem thereby making available a companion legume to A. gayanus. At the same time that research in the "llanos" ecosystem will continue at full level, research in the other ecosystems is expected to be increased in an attempt to give further impulse to the search for viable pasture production technology throughout the area of the Program's interest.

SPECIAL PROJECT

GTZ - ETES

Since 1977 the GTZ (German Agency for Technical Cooperation) has funded the ETES project whose purpose is to characterize the ranges in beef production systems in the target area the on-farm constraints to future technology adoption, and to provide the bases for on-farm validation of improved technology. The work has been done on sites in the Colombian and Venezuelan Llanos and the Brazilian Cerrado. The project is due to end in September 1981. A second phase of the project, to carry out the on-farm validation, is being discussed.

SPECIAL STUDIES

CORE RESOURCES (none)

PROGRAM COMMENTARY

The objectives of the Special Studies Unit are: (a) to develop a systematic and realistic appraisal of the land resources in CIAT's target area; and, (b) to explore the potential utilization of selected systems components in the enhancement of the prductivity of tropical crops, with special emphasis on the commodities being studied at CIAT and on the particular problems of low-resource farmers.

To achieve these objectives, the Unit operates on the basis of well-defined, terminal projects, each one of which is staffed and allocated other resources according to the respective objectives of the various projects.

SPECIAL PROJECTS

Phosphorous Project

A collaborative research project with IFDC on phosphorus is carried out by two IFDC senior staff based at CIAT. The objectives of the project are to develop direct use of low-cost phosphorus fertilizer sources for crops and pastures in acid, infertile soils of tropical and subtropical Latin America. Annual resources for the CIAT portion of this project are as follows:

Personnel (Man-years)	
Soil Fertility Expert	1.0
Soil Chemist	1.0
Support staff	12.0
Costs (CIAT part only)	
Personnel	C$ 72,000
Supplies and services	22,000
Travel	35,000
Support services	50,000
Total	$ 179,000

CARIMAGUA STATION

CORE RESOURCES

Personnel (Positions)

SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
						5	5	4	4	4	4	5	5	5	5	5	5

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	324	319	269	(16)	269	-
Supplies & Services	116	150	214	43	215	-
Travel	12	42	48	14	49	2
Replacement Equipment	9	20	30	50	40	33
Other Expenses	4	-	-	-	-	-
	465	531	561	6	573	2

* Except 1980 which is 80$.

BUDGET CHANGES

Costs of this research station are paid 50 percent by the Colombian Institute for Agriculture (ICA) and 50 percent by CIAT. The budget shown is for CIAT's share of the cost of CIAT personnel (shown in the table), ICA's personnel, of which there are 77, and supplies services and travel costs. CIAT's personnel is reduced by one auditor since this work will be handled from Palmira in future. No other personnel changes are proposed. The reduction in the cost of personnel and the increase in supplies and travel provides for small increases in the last two but is mainly to reflect the actual distribution of costs.

PROGRAM COMMENTARY

The Carimagua research station is located 350 kilometers east of Villavicencio, near the Meta-Vichada border, at 4°30'N latitude, 71°30'W longitude in the Eastern Plains of Colombia. Carimagua's climate, soil, vegetation and topographic conditions are typical of one of the greatest land resources in the world that is just beginning to be exploited - the tropical American savannas, which comprise 300 million hectares.

In 1969, ICA purchased 22,000 hectares of land, and field work was initiated in early 1970. In February 1977, an agreement was signed between ICA and CIAT for the development of a cooperative research program in the Eastern Plains. Under the terms of the agreement, an advisory committee composed of three ICA managers and three CIAT senior staff members is responsible for coordinating and directing operations of the station.

DATA SERVICES UNIT

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Head	1	1	1	1	1	1	9	9	9	9	9	9	13	13	12	12	12	12
Agroclimat.			1	1	1	1			2	2	2	2			3	3	3	3
Land System				1	1	1				2	2	2				4	4	4
Total	1	1	2	3	3	3	9	9	11	13	13	13	13	13	15	19	19	19

Director Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	253	305	396	(30)	466	18
Supplies & Services	158	160	215	31	238	11
Travel	6	7	17	143	28	65
Replacement Equipment	-	10	15	50	20	33
	417	482	643	10	752	17

* Except 1980 which is 80$.

BUDGET CHANGES

The Unit is increased by the addition of two senior staff plus support for the proposed expansion for agro-ecosystems analysis work. One senior staff position, for an agroclimatologist, is added in 1982 and another, for a land systems specialist, in 1983.

Supplies and services increase substantially mainly for the extra rental costs of the new computer equipment due for delivery in the second half of 1981.

PROGRAM COMMENTARY

The Data Services Unit provides advice and assistance in all mathematical, statistical and computational aspects of the work of CIAT both in scientific research and administration. The Unit currently has two major sections: Biometrics and Computing with a third to be added in 1982. The following are the functions and responsibilities of each section :

Biometrics Section

To provide statistical advice on all aspects of work at CIAT including planning, data collection, analysis and interpretation.

To keep abreast with current developments in statistical methodology by internal and external education and utilize and develop such techniques for the betterment of agricultural research at CIAT.

To provide a statistical computing service.

To carry out collaborative research with other workers with the aim of producing joint scientific publications.

To provide advice, assistance and engage in collaborative research work on operational research topics, such as simulation, mathematical programming, decision theory, etc.

To provide training in statistical methods both for staff within CIAT and for CIAT program courses.

Computing Section

To provide and have maintained, appropriate computer hardware for both scientific and administrative tasks at CIAT.

To provide and maintain appropriate computer software for both scientific and administrative tasks at CIAT. This includes systems software, compilers, packages and application programs.

To provide adequate documentation for all software and hardware.

To investigate all aspects of work at CIAT which might benefit from computerization.

To keep abreast with current developments in computing.

To carry out collaborative research.

To write suites of programs of general applicability.

To ensure sufficient training is obtained within and outside the section.

To provide the hardware and software to build and maintain scientific and administrative data banks and ensure that such banks are accessible to the appropriate range of personnel within a security network.

The section has an IBM System 34 which is used locally for all administrative computing and is linked by a private telephone line to the Itel AS5 computer of the Departamento Administrativo de Estadística (DANE) at Bogotá. Most of the scientific computing is currently done on this machine.

The computing workload is still increasing at a high rate - 1980 figures were 45% higher than 1979. To meet the additional demand especially in the area of information storage and retrieval or data banking activities the Unit plans to install a medium sized IBM 4331 computer which will replace the current machines and provide increased capacity, and improved facilities at a slightly lower cost than the 1981 predicted cost of the current system.

Agro-ecosystems Section

As noted this section is proposed as a new activity starting in 1982. To be cost effective CIAT's commodity programs require systematized information about their respective target areas in two main phases of their research activity: research strategy design and technology evaluation and transfer.

Specific research goals and priorities must be initially defined and constantly evaluated in the light of knowledge of existing conditions in each program's target area. A good understanding of land and climatic resources within which agricultural production takes place, and their variability and representativeness, is a necessary condition for success in generating adaptable seed based technology. This is particularly valid for CIAT commodity programs, because of the variability in ecosystems in Latin America and the strong germplasm-ecosystem interactions in all CIAT commodities.

In the case of pastures, persistence is very much affected by disease and pest tolerance/resistance. Most of the adapted forage legumes which the Program regards as highly promising (i.e., Stylosanthes, Zornia, Centrosema, Aeschynomene...) originate from the tropics of Latin America and therefore present strong gene-environmental interactions in terms of disease and pest tolerance. Results from regional trials strongly support this observation. The same considerations apply to both cassava and beans, since both of these commdoties have their center of origin in Latin America. Moreover, these two commodities are grown in a very wide diversity of cropping systems. Information from international trials suggests that there is a strong interaction between genotype, cropping system and climatic and edaphic factors. In both crops there is a complex of biological constraints which tend to occur under similar ecological conditions and vary in their severity depending on the cropping system. In rice, particularly in upland rice, a far better definition of target areas and their critical constraints are required before major steps are taken to fine tune research priorities.

Target area analysis and evaluation appear also as critical components in the technology testing and validation stage. The availability of purposely collected and organized data on each program's target area will not only help in achieving the objective but will do so in the most cost-effective manner. Sites for regional trials, international nurseries and for the on-farm validation/benchmark type of studies, should be selected in terms of the representativeness of the various sub-ecosystems. The better ability to extrapolate information to similar ecosystems will make network testing more useful. The better ability to associate germplasm to a given type or range of ecosystems, will also significantly reduce the burden on cooperating national institutions and increase the confidence in networking with CIAT. The TAC stripe review on farming systems research identified this information as the major gap in this research at CIAT.

Thus, the overall objective is a better understanding of the agro-climatic zones and cropping systems and their present and potential interactions with the germplasm, in order to provide within each commodity programs for: (a) an analytical framework for problem identification and setting of program's priorities, (b) a better understanding of national problems and resource potentials, (c) a sharper focus of the commodity program's priorities, (d) a more objective and rational basis for technology evaluation, feedback and transfer, and overall (e) a more cost-effective and efficient way of carrying the task by both CIAT and the collaborating national institutions.

The section is to collaborate with each commodity program in the collection, analysis and synthesis of relevant climatic, edaphic and crop system data on their respective target areas. It will have two senior staff: an agroclimatologist

(starting 1982) and a land system specialist (starting 1983). Rather than adding specialists in these disciplines to each of the four programs, a small central unit will provide for this expertise. The agroeconomic, economic and other disciplines input will be provided by the specialist in the respective commodity program.

DIRECTOR FOR INTERNATIONAL COOPERATION

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Director	1	1	1	1	1	1		1	1	1	1	1	2	2	2	2	2	2

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	54	143	122	(15)	123	1
Supplies & Services	-	3	3	-	3	-
Travel	14	37	28	(24)	28	-
Replacement Equipment	2	-	-	-	-	-
	70	183	153	(16)	154	-

* Except 1980 which is 80$.

BUDGET CHANGES

Travel funds for outreach activities, mainly to enable cooperators to visit CIAT, have been reduced.

PROGRAM COMMENTARY

The objective of International Cooperation is to assure the rapid and efficient transfer of improved production technologies developed at CIAT to national research and development agencies (both public and private).

International Cooperation consists of :

1. The Office of the Director for International Cooperation;
2. Training and Conferences;
3. Documentation Services;
4. Communication Support;
5. Seed Research and Training;
6. Collaborative Projects.

The Director of International Cooperation has the overall responsibility for all activities in the division. Also, in liaison with the Directors for Land Resources and Crops Research, he arranges and administers collaborative efforts with international, regional, or national institutions, through which the research endeavors of CIAT can be complemented and/or through which new technologies can be validated and adapted to conditions within a given setting.

Also ascribed to the office of the Director is the important function of providing guidance to the regional cooperation staff of the various research programs, and of assuring that this staff is provided with the necessary logistical and administrative support.

Regional Cooperation Staff

CIAT's core budget includes no staff for regional cooperation (outreach) personnel although CIAT's state of maturity obviously calls for this very necessary complement to our research and training activities.

For 1982/83 none has been included in the budget request because the guideline total given by the CGIAR Secretariat does not permit this type of major expansion. However, projections, such as they are worth, do provide for a modest start in this field.

Until these positions can be included in the core budget, CIAT will continue to seek special project funding wherever it is available to fill this gap in requirements.

The Regional Cooperation staff which CIAT currently projects as a bare minimum requirement are as follows :

TOTAL REGIONAL COOPERATION STAFF PROJECTIONS

Program		Region	Starting in:
Beans	*	Eastern Africa	1984
	+	Central America & Caribbean	1984
		Southern Cone	1984
Cassava	*	S.E. Asia	1984
		Central America & Caribbean	1985
Rice		South Andean	1984
Tropical Pastures		Central America & Caribbean	1985

\+ Currently funded by SDC special project.
* Special project funds being sought.

SPECIAL PROJECTS

Seed Unit

In November 1978 an agreement was signed with the SDC (Swiss Development Cooperation) for the funding, over a three-year period, of a Seed Training, Outreach and Research Unit. The objectives of the Unit are to:

1. Train personnel in government and private institutions primarily from all Latin American and Caribbean countries in various aspects of seed industry and seed program development.

2. Extend technical collaboration to countries in the region interested in seed program development, with the aim of expanding the production of high quality seed of improved cultivars at all levels from the breeder to

the commercial stage with main emphasis on but not restricted to the commodities with which CIAT works.

3. Conduct specific research in seed technology highly relevant to CIAT commodity interests and relevant to problems of the target areas.

4. Provide CIAT with a single unit to cooperate with commodity programs in multiplying, processing, storing and distributing advanced experimental materials, or Breeder and Basic Seed to collaborating countries for further multiplication.

Resources provided by the project are as follows:

	1979	1980	1981
Personnel (Man-years)			
Unit Head	1.0	1.0	1.0
Seed Prod. Spec.		1.0	1.0
Scientific & Superv. Staff	1.0	4.0	4.0
Other support staff	4.0	6.0	6.0
Costs	79$000	80$000	81$000
Personnel	126	257	274
Training	59	164	195
Supplies & services	18	20	23
Travel	40	22	57
Capital (Const. & equip.)	322	10	
Overhead	72	120	142
Total	637	593	691

The current project contemplates a second phase which would terminate in 1984. From 1985 the Unit is projected to come into core activities.

In addition to the above project a proposal has been made to USAID jointly by CIAT and Mississippi State University for a project which would complement the Swiss funded project and whose purpose would be to improve the seed production and delivery systems of countries in the region. The total cost over five years for the CIAT portion is estimated at around $1,500,000. This includes one senior staff position, support staff and funds for training, seminars, training materials, and an information center for seeds.

TRAINING & CONFERENCES

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud 85
Training Administ.	1	1	1	1	1	1	8	8	8	9	9	9	8	8	9	9	9	9
Conferences							1	1	1	1	1	1	3	3	3	3	3	3
Total	1	1	1	1	1	1	9	9	9	10	10	10	11	11	12	12	12	12

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	313	363	374	3	384	3
Stipends	494	362	459	27	528	15
Supplies & Services	26	24	43	79	52	21
Travel	186	149	185	24	214	16
Replacement Equipment	5	-	-	-	-	-
	1,024	898	1,061	18	1,178	11

* Except 1980 which is 80$.

BUDGET CHANGES

An extra secretary is proposed for 1982 to handle the work associated with the training courses. An extra training associate is proposed in 1983 to expand training in pastures in step with the evolution of the Tropical Pastures Program.

The 1981 budget includes very reduced resources for training. These reductions were made as a temporary measure because of funding problems. For 1982 and 1983 it is proposed to restore the level of training activities to previously projected levels. This gives increases of 81$97,000 in stipends and allowances for 1982 and 81$69,000 for 1983 and 81$36,000 in travel for 1982 and 81$28,000 for 1983. The following table shows the man-months and costs for the different training categories in the years 1980 - 1983.

	1980		1981		1982		1983	
	M-M	80$000	M-M	81$000	M-M	81$000	M-M	81$000
*Post doctoral fellows	87	199	180	325	180	325	180	325
Visiting Res.Assoc. & Thesis Scholars	93	92	150	87	220	154	270	189
Post Graduate Interns	457	397	108	93	360	226	460	291
Academic Scholars	41	82	80	98	12	12		

* Post doctoral fellows are divided between the research programs (60%) (included in the offices of the directors) and Training (40%) in recognition of the fact that some are engaged solely to help or strengthen research while others are brought in to be trained.

PROGRAM COMMENTARY

Training and Conference activities are highly integrated with, and complementary to the research endeavors of the Center. A major part of the activities is carried out in the context of the respective commodity research programs and constitute an important element in their international cooperation efforts.

Training and Conference activities serve the objective of assisting national programs to strengthen their capabilities to carry out research and development work on the commodities in the mandate of CIAT, in order to facilitate their utilization of CIAT-generated technologies and to assist in their becoming increasingly more self-sufficient in research and development.

Training

In the period 1969-1980 CIAT trained 1789 professionals, half of them in the last three years. Eighty-five percent of the training participants came from national programs in countries of Latin America, twelve percent came from Asia and Africa, and five percent from North America and Europe.

CIAT-trained personnel presently make up a substantial proportion of the research staff of collaborating national research programs in beans, cassava, rice, and tropical pastures. Many of the former CIAT training participants are also occupying important positions in extension and development organizations, including seed enterprises. Yet, many more professionals working at the country level need to be trained to complete and expand research teams, and to compensate for turn-over.

In training, priorities regarding institutions to be served are assigned in the following order: (1) national commodity research programs; (2) extension services and seed enterprises; (3) universities. CIAT strives to maintain close contact with these organizations to help them determine their training needs vis-a-vis the training opportunities which CIAT is able to offer.

The Center provides a range of training programs geared to several professional levels and disciplines. Over time, and in step with developments at the national level, CIAT training moves to progressively higher levels of training. In particular, it is expected that the number of thesis students (i.e. MS students who temporarily leave their national institutions to obtain an advanced university degree) will progressively increase over the next three years.

All of CIAT's training is commodity-based. It takes place on a decentralized basis in that each research program or unit assumes the responsibility for providing relevant training experiences to the training participants assigned to it. A centralized training coordination function is assigned to the Training Office to assure continuity of CIAT training efforts across commodity programs, effective sharing of training resources, and integration of decentralized training efforts into overall CIAT training strategies.

Conferences

Conferences are instrumental in coordinating commodity research networks and facilitating exchange of information and coordination of research strategies. One conference event (i.e., seminar, workshop or symposium) is planned for each commdity every other year. Special topic workshops involving given CIAT commodities are held in alternate years. In addition to these events, CIAT will continue to co-sponsor with other institutions and/or agencies selected conference events that are directly related to the generation and/or transfer of new production technologies in the area of CIAT's mandate.

SPECIAL PROJECTS

Course and Conference Support

CIAT's core budget provides the infrastructure for training and conferences and limited funds, even in the best of times, for the travel, stipends and allowances of trainees and the travel and services for conferences. To supplement the core resources CIAT seeks special project support for individual trainees or for whole courses or conferences. For 1982 onwards it is hoped that up to 600 man-months of trainees and several conferences will be funded in this way each year.

Auditorium

CIAT's conference facilities include an open sided amphitheatre but an auditorium, which was in the original master plan for CIAT's buildings, has never been built because of shortage of funds. The largest conference room is only sufficient for about 100 people which means that many events, including CIAT's annual program review, are too large for the facilities.

The 1976 budget included $25,000 to modify the amphitheatre so that it could be used for larger conferences. This money remains unspent because of uncertainty as to the needs and whether the relatively minor modifications this would permit would be worthwhile.

We are now convinced that with the present size of CIAT and the limitations of the present facilities, a larger complete auditorium is needed. We have had preliminary tentative discussions with the Kellogg Foundation, who financed the existing conference facilities, to see if they would be interested in financing modifications to the amphitheatre building to make it into a functional and complete auditorium. In the first instance a consultant would be needed to study the feasibility of the conversion and estimate costs. Subsequently, detailed plans and cost estimates would be prepared with a view to requesting special project funding.

Root and Tuber Project

In 1980 UNDP approved a global project for root and tuber training and technology transfer. The project includes participation by CIAT, CIP and IITA with CIAT as the lead institution and overall responsibility for the project. CIAT's portion, which is for cassava, amounts to about $100,000 per annum and provides funds for a training expert, training fellowships and courses and conferences or workshops.

COMMUNICATION SUPPORT UNIT

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERVIS.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Comm.Analysis	1	1	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1
Editor/Writing English	1	1	1	1	1	1	2	2	2	2	2	2	1	1	1	1	1	1
Editor/Writing Spanish	1	1	1	1	1	1	2	2	4	4	4	4	1	1	1	1	1	1
Graphic Arts Prod.							4	4	5	5	5	5	23	23	23	23	23	23
Public Info.							3	3	3	3	3	3	2	2	2	2	2	2
Training Mat.											5	5					2	2
Total	3	3	3	3	3	3	14	14	15	15	20	20	28	28	28	28	30	30

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	469	617	599	(3)	605	1
Supplies & Services	288	287	277	(3)	277	-
Travel	10	20	20	-	20	-
Replacement Equipment	3	30	10	(67)	15	50
	770	954	906	(5)	917	1

* Except 1980 which is 80$.

BUDGET CHANGES

Funds previously budgeted under supplies and services for film production are substituted for a video producer at the scientific and supervisory level to operate the equipment which will be purchased.

PROGRAM COMMENTARY

Unit Objectives

The objectives of the Communication Support Unit are: (a) to package and disseminate the results of CIAT's research to appropriate audiences; (b) to maintain and improve CIAT's image with donors, client countries, and the general public; (c) to serve the publication needs of other CIAT units (e.g., Documentation Services, Conferences); and, (d) to provide general information services (e.g., photography, graphic arts, Xeroxing and printing) to the Center and its various administrative entities.

Unit Activities

The Communication Support Unit has the following action plans for the various areas where a need for CIAT generated information exists.

A. Technical Information

Annual Reports. The Annual Reports of CIAT activities are published each year as separate publications, each one devoted to a research program. Reports are produced both in English and Spanish.

CIAT Report. This report of research highlights is produced as a full-color publication. It is intended to disseminate technical information explained in a popular style as a principal means of communicating the Center's activities and achievements to contacts at all levels. It is published in English and Spanish.

Other Technical Publications. CIAT has several other publications series in which technical information is being published (e.g., Research Monographs, New Production Technologies, Technology Impact Sutdies, Field Manuals, Production Manuals and Seminar Proceedings). During the 1982-83 budget cycle an attempt will be made to increase the number of these publications that are made available to the Center's research collaborators and contacts and to the interested public.

B. Newsletters

Noti-CIAT. This quarterly newsletter is designed to inform the Center's contacts on : (a) program developments at CIAT; (b) new production and research methodology resulting from CIAT's efforts; and (c) CIAT's technology transfer projects and activities. Noti-CIAT is intended for all of CIAT's contacts - technical and non-technical. It is published both in English and Spanish.

Commodity-Specific Newsletters. Four commodity-specific newsletters are produced by the Communication Support Unit. Two of these are managed in the Documentation Services Unit and two in the Communication Support Unit. The commodity-specific newsletters contain information on: (a) developments within the respective CIAT commodity programs; (b) new research and production technology (both CIAT - and non-CIAT generated); and (c) commodity-related work in cooperating regional and national programs. The purpose of these commodity-specific newsletters is to provide workers in existing networks with regular information from the respective CIAT commodity programs.

C. Training-materials

Efforts to package commodity-related technical information into didactic sets (audiotutorials) will continue during the 1982-83 budget cycle. The commodities and areas covered are: cassava, field beans, rice, tropical pasture production, weed control and seed technology.

D. General Information

To help keep the general public informed of CIAT's goals, activities and achievements, the Unit plans to continue to periodically produce information

brochures on the Center and on specific commodity programs. Also planned is a continuation of the efforts to design and produce selected audiovisual programs for visitors, the production of two short films on CIAT's activities, and the design and dissemination of a series of articles on the Center and its research efforts to be distributed through existing mass communication channels.

SPECIAL PROJECTS

In 1979 an approach was made to the Kresge Foundation, who provided the funds for the original Library and Communication Building, for $192,000 towards the cost of a separate building to house all communication facilities which long ago outgrew the limited space available in the original building. The Kresge Foundation approved a grant for the amount requested and it was paid and spent in 1980. The building, which was partly funded by $32,000 approved in the 1977 budget for extension of the existing building, will be (was) completed in May 1981.

Training Materials Project

The Kellogg Foundation has approved a three year project, which started in July 1980, to develop, produce and utilize training materials on improved agricultural production technology. The project includes personnel, supplies, services and equipment for the development of 60 audiotutorial units (each unit consists of : a set of objectives, a slide/tape presentation, a tape transcript, a study guide and evaluation material) and funds for the establishment of 8 in-country utilization centers (equipment and materials). The resources provided by the project are as follows:

	1980	1981	1982	1983
Personnel (Man-years)				
Professional staff	5.0	10.0	10.0	5.0
Clerical & other staff	2.5	5.0	5.0	2.5
Costs	80$	81$	82$	83$
Personnel	62,700	138,300	152,300	83,900
Supplies & Services	20,000	43,000	47,000	26,000
Equipment	3,000	5,000		
In-country centers	27,000	33,000	26,000	22,600
Other costs	20,500	42,600	45,800	26,100
	133,200	261,900	271,100	158,600

DOCUMENTATION SERVICES UNIT

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud 85
Info. Services	1	1	1	1	1	1	10	10	9	9	9	9	22	22	24	24	24	24

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	275	362	305	(16)	306	-
Supplies & Services	174	161	164	-	164	-
Travel	3	4	4	-	4	-
Replacement Equipment	1	-	-	-	-	-
	453	527	473	(10)	474	-

* Except 1980 which is 80$.

BUDGET CHANGES

It is proposed to eliminate one scientific and supervisory level position and substitute a microfilm operator and serials attendant at the other support staff level. Supplies are increased for the extra cost of materials for the new microfiche service.

PROGRAM COMMENTARY

Unit Objectives

Following CIAT's commodity research emphasis, the Documentation Services Unit has these objectives:

1. To provide scientific and technical information in support of research activities both at CIAT and in national institutions;

2. To transfer information about technologies available to increase agricultural production in the tropics; and

3. To project to countries an accurate image of CIAT as an institution dedicated to research and technology transfer in those commodities of CIAT's concern.

Unit Activities

Presently the Documentation Services Unit has a library collection of some 43,000 volumes and receives more than 1,200 journals regularly. In addition to operating as a specialized library, it also provides personalized services such as the Contents Page and commodity-specific documentation services.

A. Contents Pages

The Contents Pages is a current awareness publication that each month lists the Tables of Contents sections of selected journals and is distributed to subscribers in Latin America.

B. Documentation

Documentation services cover three areas : cassava, in which the Center has the only known complete collection of all materials published on this crop; field beans, limited to literature applicable to tropical environments; tropical pastures and forages. Abstract cards of articles in these areas are distributed 10 times a year to scientists worldwide.

Annual cumulative volumes of abstracts processed each year are also published. To date, four volumes have been published in cassava, three in beans, and one in tropical pastures and forages. Cassava and bean abstracts are published in Spanish and English and abstracts of the other two areas are published only in Spanish.

Specialized literature searches based on specific descriptors are done in the Documentation Center through a mechanized system of information retrieval. In 1978, 134 searches were made in four areas and 14 short bibliographies were prepared by conventional methods.

The Cassava Documentation Center also publishes a semi-annual newsletter, in English and Spanish. Other technical materials are also published to provide full state-of-the-art coverage for this commodity.

C. Computerization

The comparatively small amount of literature available on cassava has up to the present made possible the use of a simple mechanical system for organization of the documentation/information on this crop. However, expansion of the information available and services provided, as well as movement into other commodities which have a much more extensive literature resource, suggest the need to computerize the documentation services, as well as other library activities in 1982.

ADMINISTRATION

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERVIS.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Director Gral.	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2
Assist. to DG.	1	1	1	1	1	1							1	1	1	1	1	1
Controller	1	1	1	1	1	1	8	8	8	8	8	8	26	26	26	26	26	26
Exec. Officer	1	1	1	1	1	1	12	12	12	12	12	12	46	46	46	46	46	46
Total	4	4	4	4	4	4	21	21	21	21	21	21	75	75	75	75	75	75

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	977	1,221	1,216	-	1,219	-
Supplies & Services	112	129	129	-	129	-
Travel	82	75	78	4	78	-
Replacement Equipment	10	6	8	33	11	37
	1,181	1,431	1,431	-	1,437	-

* Except 1980 which is 80$.

BUDGET CHANGES

Travel is increased to reflect better the needs as indicated by expenses in 1980.

PROGRAM COMMENTARY

Grouped under Administration are the Board of Trustees functions and the offices of the Director General, the Controller and the Executive Officer. These offices, together with the three Directors, are responsible for overall administrative and financial management of the Center.

GENERAL OPERATING EXPENSES

CORE RESOURCES

Personnel (Positions)

	SENIOR STAFF						SCIENTIFIC & SUPERV.						CLERICAL & OTHER					
	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85	Act. 80	Bud. 81	Bud. 82	Bud. 83	Bud. 84	Bud. 85
Phys. Plant Maintenan							3	3	3	3	3	3	52	52	52	52	52	52
Phys. Plant Security													36	36	42	42	42	42
Phys. Plant Cleaning													61	61	61	61	61	61
Phys. Plant Gardens													11	12	12	12	12	12
Motor Pool							1	1	1	1	1	1	51	51	51	51	51	51
Total							4	4	4	4	4	4	211	212	218	218	218	218

Direct Costs (81$ thousands *)

	Current Budget		Proposed Budget			
	Actual 1980	Revised 1981	1982	% Incr.	1983	% Incr.
Personnel	918	1,072	1,117	4	1,118	-
Supplies & Services	1,014	1,359	1,345	(1)	1,379	3
Travel	15	19	14	(26)	14	-
Replacement Equipment	227	260	364	40	410	13
Other Expenses	176	182	230	26	232	1
	2,350	2,892	3,070	6	3,153	3

* Except 1980 which is 80$.

BUDGET CHANGES

Six security guards for a total of 42, have been added to make up in part for a recent Government decision to reduce the working day for these people to the normal 8 hours.

No changes are proposed in supplies and services for the physical plant or motor pool since increases are expected to be handled in the special project services rotating fund described in the next section of this document.

Changes in supplies and services, travel and other expenses noted in the above table are caused by changes in general operating expenses. Details of these are given in the following table:

General Operating Expenses (000)

	Actual 1980	Budget 1981	Proposed 1982	Proposed 1983
	80$	81$	81$	81$
Office supplies	54	95	65	65
Electricity	258	310	370	400
Boiler fuel, chemicals, etc.	49	39	60	65
Telephone	82	92	100	100
Telex & cables	24	44	30	30
Postage	63	137	77	77
Insurance & other	176	187	230	232
	706	904	932	969

Changes shown above for 1982/83 are mainly to reflect actual experience in 1980. As can be seen office supplies have been reduced, electricity has been increased because of much higher costs in 1981 and the extra consumption expected when the buildings completed in 1981 are all on stream in 1982. Postage charged to this budget has been substantially reduced now that we are charging for publications and covering the postage out of the rotating fund. Insurance and other increase mainly because of the higher exchange differences resulting from higher devaluation of the Colombian peso and higher interest costs.

PROGRAM COMMENTARY

The Palmira installations consist of about 20 buildings or complexes of buildings including: two laboratory buildings, three office buildings, two field laboratory buildings, seed processing and storage facilities, communications and library buildings, conference facilities, food, housing and recreational facilities, six glasshouses, a warehouse, a germplasm store and service buildings for machinery and vehicle maintenance, laundry facilities, water treatment, etc. The gross area of buildings is 42,000 m^2 of which about 50% is air-conditioned. The whole complex is served by about 26,000 m^2 of roads and parking areas and is surrounded by about 100,000 m^2 of gardens.

Other than electricity, for which only standby and emergency capacity is maintained, CIAT provides all its own services. The Physical Plant includes resources to run these services, maintain all buildings and grounds and provide security.

CIAT operates a fleet of about 240 vehicles which includes buses, trucks, vans, pickups, jeeps and passenger cars from various manufacturers. The Motor Pool is responsible for servicing, repairing and maintaining these vehicles and for providing bus services to transport personnel to and from work and regular services during the day and night to Cali and Palmira for employees, trainees and visitors.

SPECIAL PROJECT SERVICES

Throughout this document frequent reference is made to special projects which complement and expand CIAT's core activities. Ideally, all activities would best be handled within the core budget but shortage of core funding and the availability of additional funding, often from the same core donors, when presented as special projects, has resulted in substantial funding of special projects.

Special projects entail the provision of support services and utilize CIAT's central facilities and services. For these, charges are made based on estimated costs of services - e.g. vehicle upkeep, field services, space, etc.- plus an overhead charge for unquantifiable services, such as the library, finance and administration, based on the ratio of the cost of these services, for the whole of CIAT, to the cost of the activities supported.

The charges made to special projects are added to other income generated from farm production and interest to give a total figure which is deducted from gross budget requirements in arriving at the net requirements from core donors. This procedure is inconvenient for two reasons :

1) the administrative, support and general operating costs shown in the core budget are unduly inflated in relation to the core activities;

2) the number of special projects to be supported and the services required are difficult to predict when the core budget is prepared; this means that service and support units can be more or less than required and similarly the income generated can be more or less than anticipated.

We propose, therefore, a gradual phasing out of the old procedure and a gradual phasing in of a new procedure which would avoid the problems noted. The new procedure would establish a rotating fund for special project services. This fund would be credited with the service charges made to special projects and would be charged with the extra costs occasioned in support and service units because of special projects. This procedure would have the following advantages :

1) the core budget (eventually) will only include resources in the support and service units to provide services to core activities.

2) resources in the support and service units for special project support can be charged to the rotating funds and adjusted up or down as special projects are added or deleted according to requirements and the charges made to the projects.

CIAT core budget projections include resources for the support of and income from charges to special projects. This proposed change in procedure cannot, therefore, be made fully effective immediately. However, income projected for future years has been held constant at $400,000 and it is expected that as farm and interest income increase, the income from special project charges can be released to establish the rotating fund and still achieve the projected $400,000 income.

The 1982/83 budget has assumed the following expenses and income for the special project services rotating fund:

	1982	1983
EXPENSES	81$	81$
* Personnel	41,000	62,000
+ Supplies & services	19,000	23,000
	60,000	85,000
INCOME	60,000	85,000

* Includes two positions for Controller and five for Physical Plant and Motor Pool.

\+ Includes funds for Station Operations and Physical Plant.

CAPITAL REQUIREMENTS

The proposed capital budget amounts to C$522,000 for 1982 and C$322,000 for 1983 all for equipment. In addition C$80,000 in 1982 and C$290,000 in 1983 is needed to maintain working capital at the equivalent of 30 days' operating expenses - the CGIAR norm.

There is a continuing need for additional items of equipment as new products come on the market and as equipment needs change with the development of research. Amounts have been allocated to each program according to its size. The lists given later in this section attempt to show what each program now considers as priority items for purchase out of its allocation. Before actual purchase takes place, each request is subjected to rigorous internal review.

SUMMARY OF CAPITAL REQUIREMENTS

	Budget		Projections	
	1982	1983	1984	1985
	C$	C$	C$	C$
Category I Projects (Construction)				
Glasshouse			110,000	
Category II Expenditures (Equipment)	522,000	322,000	532,000	506,000
Totals	522,000	322,000	642,000	506,000

SPECIFIC EQUIPMENT REQUIREMENTS

	Budget		Projections	
	1982	1983	1984	1985
	C$	C$	C$	C$
Beans				
Seed counter/printer (shared with Rice)	10,000			

	Budget		Projections	
	1982	1983	1984	1985
Screenhouse (Popayán)	6,000			
Injection chamber	3,500			
Incubator	3,000			
Threshers (2)	8,000			
Photperiod installation (Popayan)	8,000			
Centrifuge rotor	5,000			
Miscellaneous	2,500			
Irrigation equipment (Popayan)		8,000		
Growth cabinet/incubator		4,500		
Screenhouse (CIAT-Palmira)		6,000		
Inoculation equipment		4,500		
Land improvements Popayan		5,000		
Micromanipulator		3,500		
Microscope		4,000		
Miscellaneous		3,500		
	46,000	39,000	58,000	54,000

Cassava

Laminar flow hood	1,500			
Camera for stereo microscope	3,700			
Spectrophotometer	4,000			
Mettler P 10 balance	3,200			
Field balances (10 units)	1,800			
Motorcycles (2)	1,800			
Ohaus moisture balance	1,000			
Refrigerated centrifuge	5,500			
Sundries	7,500			
Water still		1,300		
Fume hood		1,400		
Spectrophotometer		4,000		
pH meter		1,000		
Glucose fructose, sucrose, starch analyser		5,000		

	Budget		Projections	
	1982	1983	1984	1985
Refrigerated water bath		1,500		
Lysimeter		8,000		
Gas mixing pumps		4,000		
Sundries		8,800		
	30,000	35,000	49,000	54,000
Rice				
Seed counter/printer (shared with Beans)	10,000			
Shaker incubator	1,800			
Spectrophotometer	2,000			
Incubator	2,000			
Satake dehuller	2,000			
Nets for seedbeds	2,000			
Sample dryer	2,000			
Moisture tester	1,000			
Sundries	7,200			
Hepa filter		1,000		
Freeze-dryer		3,500		
Glassware		1,000		
Quality glassware		2,000		
Irrigation equipment		6,400		
Deionizer		2,000		
Precleaner		1,500		
Sundries		5,600		
	30,000	23,000	30,000	25,000
Genetic Resources				
Stereo microscope	700			
Laminar flow cabinet	1,500			
Thermographs		700		
Laboratory furniture		1,000		
Sundries	1,800	2,300		
	4,000	4,000	4,000	5,000

	Budget		Projections	
	1982	1983	1984	1985
Laboratory Services				
X-Y Recorder	3,000			
Drying oven	1,000			
Automatic water still		4,000		
Precision diluter		1,500		
Sundries	3,000	500		
	7,000	6,000	7,000	8.000
Station Operations				
Irrigation tubing	9,000	7,000		
Air compressor (Quilichao)	1,500			
Welding equipment "		3,000		
Rotary hoe	5,000			
Diesel motor for deepwell	10,000			
Mechanization equipment		15,000		
Sundries	4,500	5,000		
	30,000	30,000	35,000	35,000
Tropical Pastures				
Pasture seeders (C/gua)		4,500		
Windmills & wells (C/gua)	5,500	4,500		
Grass flail harvester	7,000			
Field screenhouse (Quilichao & Orocue)	6,500			
Screenhouse (Carimagua)		22,000		
Insect rearing room	5,000			
Cattle scales (C/gua)	3,000	1,500		
Stereo-microscopes (2)	2,500	2,500		
Field plot thresher (Brazil)	9,000			
Freezers (3)	2,000	1,000		
Incubator	1,500			
Soil temperature monitor	1,500			
Custom planter/tillage (Carimagua)	4,000			
Fences	6,000			
Corrals (Carimagua)		10,000		

	Budget		Projections	
	1982	1983	1984	1985
Oven (1)	1,000			
Irrigation equip. & pumps	3,000	2,500		
Field plot equipment	5,500	7,500		
Sun dryer		7,000		
	63,000	63,000	74,000	80,000
Carimagua				
Front end loader	25,000			
Field storage sheds		12,000		
Pumps		3,000		
	25,000	15,000	20,000	25,000
Data Services				
Printer plotter	9,000			
Terminals		10,000		
Sundries	1,000			
	10,000	10,000	12,000	15,000
Training & Conferences				
Shelving for audiotutorials	2,000			
Portable video camera recorder		3,000		
Sundries	1,000			
	3,000	3,000	4,000	4,000
Communication Support				
Folding machine	12,000			
Display and storage furniture	6,000			

	Budget		Projections	
	1982	1983	1984	1985
Lay-out table	2,000			
Audio recording/editing equipment		8,000		
Binding equipment		7,000		
	20,000	15,000	20,000	25,000
Documentation				
Shelving & card files	4,000	4,000	4,000	5,000
Controller				
Calculators	2,000	2,000	2,000	3,000
Executive Officer				
Security equipment	34,000			
Furniture & furnishings for additional personnel (all programs) :				
Senior staff	6,000	4,000		
Scientific & Superv.	9,000	9,000		
Clerical & Other	18,000	11,000		
Vehicles for new staff	51,000	33,000		
	118,000	57,000	183,000	138,000
Physical Plant				
Sweepers (4)	7,000			
Vacuum cleaners (3)		2,100		
Automatic floor washers		3,000		
Pipe rodder	1,000			
Power hack-saw	2,500			
Metal shaper	3,500			
Air compressor		1,300		
Puller service set		1,500		

	Budget		Projections	
	1982	1983	1984	1985
Mobile scaffold		3,000		
Metal finisher		3,000		
Sundries	2,000	2,100		
	16,000	16,000	20,000	20,000
Motor Pool				
Buses (2)	96,000			
Wheel aligner	15,000			
Sundries	3,000			
	114,000		10,000	10,000
TOTAL EQUIPMENT	522,000	322,000	532,000	506,000

CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

TABLE I

SUMMARY OF MAN-YEARS AND COSTS BY PROGRAM AND ACTIVITY

	ACTUAL EXPENSES				*ORIGINAL		REVISED		PROPOSED BUDGET				PROJECTIONS			
	1979		1980		1981		1981		1982		1983		1984		1985	
	M-Y	79$000	M-Y	80$000	M-Y	79$000	M-Y	81$000	M-Y	81$000	M-Y	81$000	M-Y	81$000	M-Y	81$000
CROPS RESEARCH																
Office of the Director	1.1	216	1.0	234	1.0	261	1.0	324	1.0	287	1.0	292	1.0	292	1.0	292
Beans	9.7	1354	10.4	1526	12.0	1509	12.0	1845	12.5	1944	13.0	2014	14.5	2221	16.5	2380
Cassava	9.0	1263	10.0	1531	10.0	1377	10.0	1691	10.0	1729	10.0	1737	11.0	1934	13.5	2233
Rice	2.9	367	3.0	429	4.5	667	3.5	624	4.5	713	5.5	867	6.5	991	7.0	1036
Genetic Resources	3.0	287	2.0	260	2.0	263	2.0	326	2.0	326	2.0	327	2.0	333	2.0	340
Laboratory Services		178	1.0	337	1.0	286	1.0	362		293		303		313		323
Stations Operations	1.0	594	1.0	633	1.0	570	1.0	737	1.0	787	1.0	807	1.0	837	1.0	857
SUB-TOTAL	26.7	4259	28.4	4950	31.5	4933	30.5	5909	31.0	6079	32.5	6347	36.0	6921	41.0	7461
LAND RESOURCES RESEARCH																
Office of the Director	1.1	191	1.0	207	1.0	209	1.0	271	1.0	243	1.0	240	1.0	240	1.0	240
Tropical Pastures	15.3	2255	16.8	2474	20.5	2356	20.0	2865	20.0	2772	20.0	2786	20.5	2859	21.5	2973
Carimagua		465		465		417		531		561		573		583		593
Data Services	0.6	324	1.0	417	1.0	387	1.0	482	2.0	643	2.5	752	3.0	815	3.0	820
SUB-TOTAL	17.0	3235	18.8	3563	22.5	3369	22.0	4149	23.0	4219	23.5	4351	24.5	4497	25.5	4626
Swine	2.0	209														
TOTAL RESEARCH	45.7	7703	47.2	8513	54.0	8302	52.5	10058	54.0	10298	56.0	10698	60.5	11418	66.5	12087
INTERNATIONAL COOPERATION																
Office of the Director	1.0	135	0.5	70	1.0	144	1.0	183	1.0	153	1.0	154	1.0	154	1.0	154
Training and Conferences	1.3	819	1.0	1024	1.0	1116	1.0	898	1.0	1061	1.0	1178	1.0	1272	1.0	1272
Communication Support	2.5	577	1.8	770	3.0	762	3.0	954	3.0	906	3.0	917	3.0	1018	3.0	1023
Documentation Services	1.0	403	0.8	453	1.0	431	1.0	527	1.0	473	1.0	474	1.0	474	1.0	474
Seeds															0.5	105
TOTAL INT'L. COOP.	5.8	1934	4.1	2317	6.0	2453	6.0	2562	6.0	2593	6.0	2723	6.0	2918	6.5	3028
ADMINISTRATION																
Board of Trustees		47		48		41		52		55		55		55		55
Director General	1.0	163	1.0	170	2.0	207	2.0	263	2.0	257	2.0	258	2.0	258	2.0	258
Controller	1.0	356	1.0	398	1.0	363	1.0	454	1.0	447	1.0	448	1.0	449	1.0	450
Executive Officer	1.0	492	1.0	565	1.0	520	1.0	662	1.0	672	1.0	676	1.0	681	1.0	683
TOTAL ADMINISTRATION	3.0	1058	3.0	1181	4.0	1131	4.0	1431	4.0	1431	4.0	1437	4.0	1443	4.0	1446
GENERAL OPERATING EXPENSES																
Physical Plant		845		979		864		1126		1184		1194		1244		1254
Motor Pool		503		555		523		842		910		940		987		1000
General Expenses		576		816		727		924		976		1019		1011		1021
TOTAL GENERAL OPERATING		1924		2350		2114		2892		3070		3153		3242		3275
OTHER																
Contingency						140		168		174		180		190		198
Provision for Price Changes						3241				2283		5037		8508		12630
TOTAL CORE	54.5	12619	54.3	14361	64.0	17381	62.5	17111	64.0	19849	66.0	23228	70.5	27719	77.0	32664
TOTAL SPECIAL PROJECTS		1782		2333		2750		2404		2500		2750		3000		3000
CATEGORIES OF EXPENSES																
Personal Services		9012		10210		10254		12281		12259		12630		13296		13930
Supplies		1311		1546		1343		1757		1861		1875		1919		1940
Services		929		1118		1096		1340		1393		1456		1474		1479
Travel		1004		935		799		936		1027		1077		1188		1238
Equipment		242		372		363		447		622		741		912		1017
Other		121		180		145		182		230		232		232		232
Contingency						140		168		174		180		190		198
SUB-TOTAL		79$ 12619		80$ 14361		79$ 14140		81$ 17111		81$17566		81$ 18191		81$ 19211		81$ 20034
Provision for Price Changes						3241				2283		5037		8508		12630
TOTAL CORE		C$ 12619		C$ 14361		C$ 17381		C$ 17111		C$ 19849		C$ 23228		C$ 27719		C$ 32664

* This is the 1981 budget presented in the 1980/81 Midterm Report as modified at that time.

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CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

TABLE II

SUMMARY OF SOURCES AND APLICATION OF FUNDS

(C US$ Thousands)

	ACTUAL		1981 BUDGET		PRPOSED BUDGET		PROJECTIONS	
	1979	1980	Approved	Estimated	1982	1983	1984	1985
SOURCES OF FUNDS								
Core Operations (Unrestricted)								
Australia	179	209		290				
Belgium	197	201		340				
Canada (CIDA)	984	979		1,075				
European Economic Community	1,102	1,373		1,610				
Ford Foundation	150	100		100				
Germany (Federal Republic)	1,183	1,276		1,235				
Interamerican Development Bank (IDB)	2,650	2,900		3,190				
International Development Association (World Bank)	379							
International Fund for Agricultural Development (IFAD)		770		900				
Japan	400	800		960				
Mexico		124		250				
Netherlands	300	300		285				
Norway	201	210		197				
Rockefeller Foundation	300	300		150				
Spain				50				
Switzerland	300	402		412				
United Kingdom	445	528		560				
United States (AID)	3,300	3,650		4,350				
Unidentified sources			16,981	757	19,449	22,828	27,319	32,264
Balance from previous period	82	7						
Income applied in year	474	232	400	400	400	400	400	400
TOTAL CORE OPERATING FUNDS	12,626	14,361	17,381	17,111	19,849	23,228	27,719	32,664
Capital								
International Development Association (World Bank)	938	500		417				
Other a/	2	147						
Unidentified sources			795	222	602	612	1,001	876
Balance from previous period	763	803		(71)				
Income applied in year		280						
Balance of working funds	800	950	1,180	1,326	1,551	1,631	1,921	2,280
TOTAL CAPITAL FUNDS	2,503	2,680	1,975	1,894	2,153	2,243	2,922	3,156
Special Projects b/								
Belgium	(74)	40		24				
CIMMYT	49	87		90				
FAO		10						
Ford Foundation	5			(35)				
German Agency for Technical Cooperation (GTZ)	51	91		107				
German Foundation for International Development	42	(15)						
Interamerican Development Bank (IDB)	39	4						
IBPGR	5	23		12				
International Development Research Centre (IDRC)	196	108		64				
International Fertilizer Development Center (IFDC)	121	133		186				
International Rice Research Institute (IRRI)	162	70		120				
Kellogg Foundation		133		262				
Kettering Foundation		5		16				
Kresge Foundation		192						
Netherlands		43						
Rockefeller Foundation	31	47		26				
Switzerland	718	89		1,121				
UN Development Programme (UNDP)		834		139				
United States (AID)	130	83		23				
Other	(15)							
Unidentified sources			2,750	175	2,500	2,750	3,000	3,000
Balance from previous period	1,152	830	700	474	400	400	400	400
TOTAL SPECIAL PROJECTS	2,612	2,807	3,450	2,804	2,900	3,150	3,400	3,400
TOTAL FUNDS	17,741	19,848	22,806	21,809	24,902	28,621	34,041	39,220
APPLICATION OF FUNDS								
Core Operations	12,619	14,361	17,381	17,111	19,849	23,228	27,719	32,664
Capital c/	750	1,425	545	343	522	322	642	506
Special Projects	1,782	2,333	2,750	2,404	2,500	2,750	3,000	3,000
Unexpended Balances								
Unrestricted Core	7							
Capital	803	(71)						
Working Funds c/	950	1,326	1,430	1,551	1,631	1,921	2,280	2,650
Special Projects	830	474	700	400	400	400	400	400
SUB-TOTAL	2,590	1,729	2,130	1,951	2,031	2,321	2,680	3,050
TOTAL APPLICATIONS	17,741	19,848	22,806	21,809	24,902	28,621	34,041	39,220
Memo :								
1. Total Core Operating Funds Required	12,619	14,361	17,381	17,111	19,849	23,228	27,719	32,664
Less Unexpended balance previous period	(82)	(7)						
Less Earned Income Applied	(474)	(232)	(400)	(400)	(400)	(400)	(400)	(400)
Net Core Operating Funds Required	12,063	14,122	16,981	16,711	19,449	22,828	27,319	32,264
2. Total Capital Funds Required	2,501	2,533	1,975	1,894	2,153	2,243	2,922	3,156
Less Unexpended balance previous period	(763)	(803)		71				
Less Balance of Working Funds	(800)	(950)	(1,180)	(1,326)	(1,551)	(1,631)	(1,921)	(2,280)
Less Earned Income applied		(280)						
Net Capital Funds Required	938	500	795	639	602	612	1,001	876
3. Total Funds Required from Donors	13,001	14,622	17,776	17,350	20,051	23,440	28,320	33,140
4. Total Earned Income	474	512	400	400	400	400	400	400
Applied to Core Operations	(474)	(232)	(400)	(400)	(400)	(400)	(400)	(400)
Applied to Capital		(280)						
Balance	-	-	-	-	-	-	-	-

a/ These amounts are the increases in the value of replaced assets; similar amounts are included in Capital in the Application section.
b/ Figures shown for 1981 are estimates for ongoing and potential special projects.
c/ Figures do not include CIAT's aircraft purchase.

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CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL — TABLE III

SUMMARY FINANCIAL DATA 1979 - 1983

(C US$ Thousands)

	Actual 1979	Actual 1980	* Original 1981	Revised 1981	Budget 1982	Budget 1983
Current Assets						
Cash	2,501	1,471	2,300	1,645	1,790	2,145
Receivable from Donors	197	202	500	300	400	500
Receivable from Employees	68	172	130	700	1,000	1,300
Receivable from Others	1,492	1,371	1,200	1,500	1,500	1,600
Inventories	756	1,021	750	1,000	1,100	1,200
Prepaid Expenses	15	5	10	10	15	20
Total Current Assets	5,029	4,242	4,890	5,155	5,805	6,765
Fixed Assets						
Research Equipment	2,719	3,183				
Aeroplane	676	676				
Vehicles	1,674	2,550				
Furnishings & Office Equipment	1,212	1,247				
Buildings	5,994	6,029				
Other	203	218				
Total Fixed Assets	12,478	13,903	14,439	14,245	14,767	15,089
TOTAL ASSETS	17,507	18,145	19,329	19,400	20,572	21,854
Liabilities						
Bank Overdraft	168	73	500	200	300	400
Bank Loan	450					
Accounts Payable	2,357	2,601	2,200	3,000	3,300	3,700
Grants Received in Advance		305	614	400	500	600
Total Liabilities	2,975	2,979	3,314	3,600	4,100	4,700
Fund Balances						
Invested in Fixed Assets	12,478	13,903	14,439	14,245	14,767	15,089
Unexpended Funds :						
Core Unrestricted	7					
Working Fund Grants	414	860	876	1,155	1,305	1,665
Capital Grants	803	(71)				
Special Projects	830	474	700	400	400	400
Total Fund Balances	14,532	15,166	16,015	15,800	16,472	17,154
TOTAL LIABILITIES AND FUND BALANCES	17,507	18,145	19,329	19,400	20,572	21,854

* These are the data which, although not published in the 1980/81 Midterm Report, reflect the revisions incorporated at that time.

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TABLE V

CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

BUDGET AND PROJECTION OF POSITIONS AND MANPOWER

	SENIOR STAFF								SCIENTIFIC & SUPERVISORY STAFF							
	1982		1983		1984		1985		1982		1983		1984		1985	
	Pos.	M-Y	Pos.	M-Y	Pos.	M-Y	Pos.	M-Y	Pos.	M-Y	Pos.	M-Y	Pos.	M-Y	Pos.	M-Y
CROPS RESEARCH																
Office of the Director	1	1.0	1	1.0	1	1.0	1	1.0								
Beans	13	12.5	13	13.0	16	14.5	17	16.5	28	27.0	28	28.0	28	28.0	28	28.0
Cassava	10	10.0	10	10.0	12	11.0	15	13.5	22	22.0	22	22.0	24	23.0	24	24.0
Rice	5	4.5	6	5.5	7	6.5	7	7.0	11	10.0	13	12.0	13	13.0	13	13.0
Genetic Resources	2	2.0	2	2.0	2	2.0	2	2.0	5	5.0	5	5.0	6	5.5	6	6.0
Laboratory Services									4	4.0	4	4.0	4	4.0	4	4.0
Station Operations	1	1.0	1	1.0	1	1.0	1	1.0	4	4.0	4	4.0	4	4.0	4	4.0
SUB-TOTAL	32	31.0	33	32.5	39	36.0	43	41.0	74	72.0	76	75.0	79	77.5	79	79.0
LAND RESOURCES RESEARCH																
Office of the Director	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0
Tropical Pastures	20	20.0	20	20.0	21	20.5	22	21.5	36	36.0	36	36.0	36	36.0	36	36.0
Carimagua									4	4.0	4	4.0	4	4.0	4	4.0
Data Services	2	2.0	3	2.5	3	3.0	3	3.0	11	11.0	13	12.0	13	13.0	13	13.0
SUB-TOTAL	23	23.0	24	23.5	25	24.5	26	25.5	52	52.0	54	53.0	54	54.0	54	54.0
TOTAL RESEARCH	55	54.0	57	56.0	64	60.5	69	66.5	126	124.0	130	128.0	133	131.5	133	133.0
INTERNATIONAL COOPERATION																
Office of the Director	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0
Training & Conferences	1	1.0	1	1.0	1	1.0	1	1.0	9	9.0	10	9.5	10	10.0	10	10.0
Communication Support	3	3.0	3	3.0	3	3.0	3	3.0	15	14.5	15	15.0	20	20.0	20	20.0
Documentation Services	1	1.0	1	1.0	1	1.0	1	1.0	9	9.0	9	9.0	9	9.0	9	9.0
Seeds							1	0.5							2	1.0
TOTAL INTERNATIONAL COOP.	6	6.0	6	6.0	6	6.0	7	6.5	34	33.5	35	34.5	40	40.0	42	41.0
ADMINISTRATION																
Director General	2	2.0	2	2.0	2	2.0	2	2.0	1	1.0	1	1.0	1	1.0	1	1.0
Controller	1	1.0	1	1.0	1	1.0	1	1.0	8	8.0	8	8.0	8	8.0	8	8.0
Executive Officer	1	1.0	1	1.0	1	1.0	1	1.0	12	12.0	12	12.0	12	12.0	12	12.0
TOTAL ADMINISTRATION	4	4.0	4	4.0	4	4.0	4	4.0	21	21.0	21	21.0	21	21.0	21	21.0
GENERAL OPERATING																
Physical Plant									3	3.0	3	3.0	3	3.0	3	3.0
Motor Pool									1	1.0	1	1.0	1	1.0	1	1.0
TOTAL GENERAL OPERATING									4	4.0	4	4.0	4	4.0	4	4.0
ROTATING FUNDS																
Food & Housing									2	2.0	2	2.0	2	2.0	2	2.0
Farm Production									2	2.0	2	2.0	2	2.0	2	2.0
Aircraft Operation									2	2.0	2	2.0	2	2.0	2	2.0
Special Project Support Services									1	1.0	1	1.0	1	1.0	1	1.0
TOTAL ROTATING FUNDS									7	7.0	7	7.0	7	7.0	7	7.0
GRAND TOTAL	65	64.0	67	66.0	74	70.5	80	77.0	192	189.5	197	194.5	205	203.5	207	206.0
Less Vacancy Factor		6.4		6.6		7.0		7.7		11.4		11.7		12.2		12.4
NET TOTAL	65	57.6	67	59.4	74	63.5	80	69.3	192	178.1	197	182.8	205	191.3	207	193.6

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