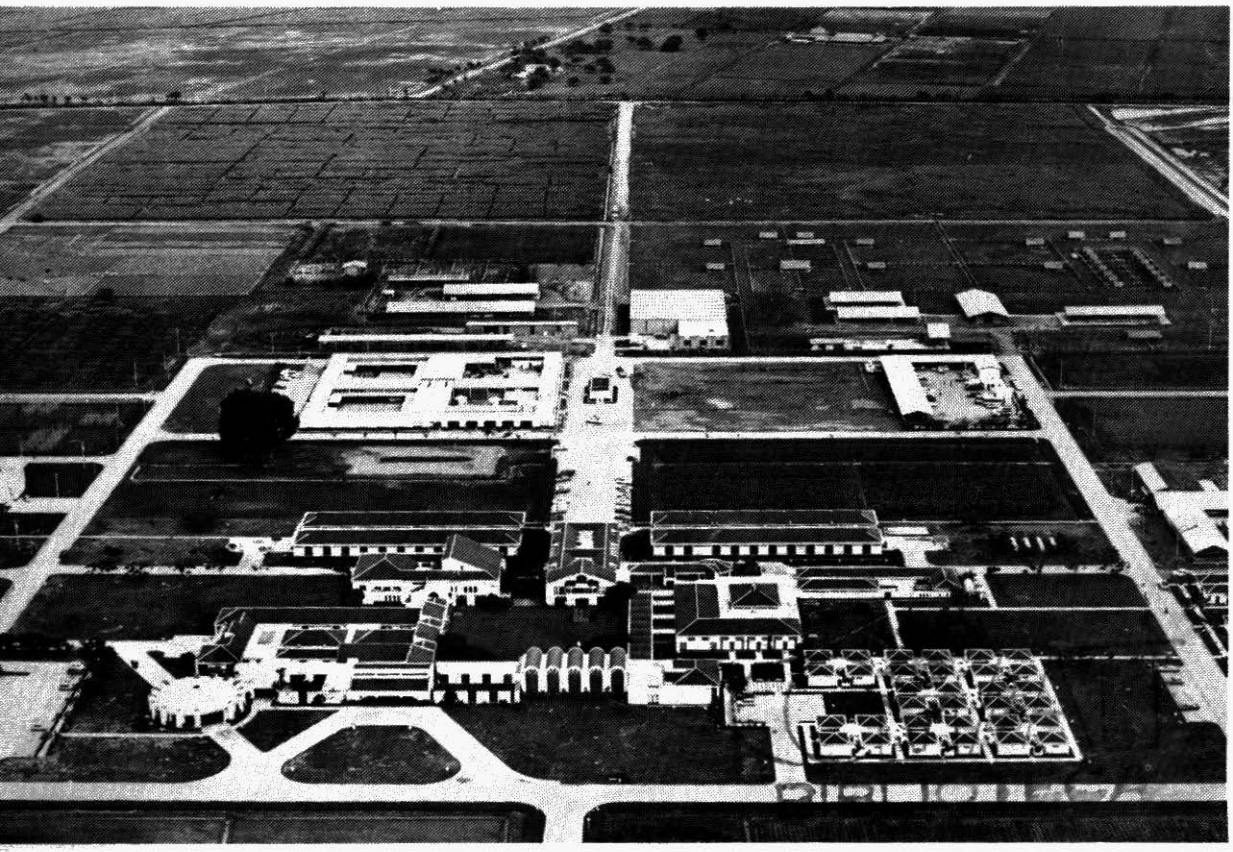
# CIAT Program and Budget Proposal 1978-1979





Centro Internacional de Agricultura Tropical

# Contents



(Continued)

6/6/77

# Objectives

## 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 identification 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.

* 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 properly work 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 area 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 to both 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 insured and improved nutritional objectives must be met.

* Postharvest factors such as processing, storage and marketing are not included in the functional scope. Some of these factors, however, will need to be dealt with 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 1978-1979

# Budget Request and Projection

The requested budget for 1978-1979 amounts to $21,971,000 for core operations, divided $10,059,000 for 1978 and $11,912,000 for 1979, and $1,323,000 for capital divided $667,000 for 1978 and $656,000 for 1979. Earned income is estimated at $800,000 for the two years. The net request to donors will depend on decisions of donors on the disposition of surplus funds from 1976 and 1977. The proposed budget includes 61 senior staff positions for an increase of 7 positions over the 54 for 1977.

The following table compares actual figures for 1976 with the original and revised budgets for 1977 and budgeted figures for 1978-1979.

| | Actual 1976 | Original 1977 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 / Total 1976/77 |
|---|---|---|---|---|---|---|---|---|
| Senior staff positions | 48 | 54 | 54 | 61 | 61 | 122 | 13 | 20 |
| Senior staff man-years | 40.4 | 51.5 | 48.8 | 57.7 | 60.1 | 117.8 | 18 | 32 |
| Core operations ($ ,000) | 5,903 | 8,614 | 8,330 | 10,059 | 11,912 | 21,971 | 21 | 54 |
| Capital ($ ,000) | 356 | 977 | 977 | 667 | 656 | 1,323 | (32) | |
| | 6,259 | 9,591 | 9,307 | 10,726 | 12,568 | 23,294 | 15 | 50 |
| Income ($ ,000) | 335 | 350 | 350 | 400 | 400 | 800 | 14 | 17 |
| | 5,924 | 9,241 | 8,957 | 10,326 | 12,168 | 22,494 | 15 | 51 |

The budget and projections include more senior staff than we projected in our 1977 Program and Budget document for the period 1978-1980. However, in spite of increasing staff above earlier projections we have kept dollar figures, in constant terms, very similar to earlier projections. The following table compares the budget and projection (excluding inflation) for 1978-1980 with figures projected in the 1977 document.

| | 1978 | | | 1979 | | | Total 1978/79 | 1980 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Positions | M-Y | $ ,000 | Positions | M-Y | $ ,000 | $ ,000 | Positions | M-Y | $ ,000 |
| Figures in 1977 document | 57 | 54.7 | 8,994 | 59 | 56.5 | 9,284 | 18,278 | 58 | 57.0 | 9,416 |
| Present request and projection | 61 | 57.7 | 8,943 | 61 | 60.1 | 9,453 | 18,396 | 65 | 63.6 | 10,076 |

In addition to the total of $1,323,000 for capital, we are including an increase of $250,000 in working capital to maintain the total available at the equivalent of 30 days' operating expenses. This is divided $100,000 in 1978 and $150,000 in 1979 (see Table II at the end of this document).

The table in the next column analyzes the difference between the revised 1977 budget and each of the two years for the 1978-79 budget.

A brief explanation of each of the increases in the table follows (the paragraph numbers refer to those given against each item in the list):

1. The high turnover of staff in 1976 which we reported in the 1977 budget document and the inevitable delays in filling vacancies has meant that, although we have added 12 senior staff since September 1976, there are still 10 positions vacant as of the time of writing. For the 10 positions four persons have accepted our employment offers. The cost of having these and other junior staff positions filled for the whole year will add about $298,000 to the 1978 budget. Similarly, the cost of filling new positions added in 1978 for the whole of 1979 will add about $295,000 to our 1979 budget.

2. Recently inflation in Colombia has been running at a high rate but the constant devaluation of the peso, which has traditionally cushioned the impact in dollar terms, has slowed with the result that the net inflation rate is higher than we had hoped. In projecting inflation and devaluation, we have sought information and advice from many sources to arrive at various rates of inflation for Colombia and the United States (the country from which we import most items not purchased locally) and the rate of devaluation of the Colombian peso. The rates so determined were then weighted according to the mix of locally purchased and imported goods and services to develop composite rates. These rates, which have been used in arriving at

| | | Increase 1978 over 1977 | | Increase 1979 over 1978 | |
|---|---|---|---|---|---|
| | $ ,000 | % | $ ,000 | % |
| 1977 (1978) Core Operation Budget | 8,330 | | 10,059 | |
| 1. Cost of full year's operation with level of activity assumed for end of 1977 (and 1978) | 298 | 3.6 | 295 | 2.9 |
| 2. Inflation | 1,116 | 13.4 | 1,343 | 13.4 |
| 3. Expansion of programs | | | | |
| (a) Additional senior staff (8) | 201 | 2.4 | - | - |
| (b) Additional scientific and supervisory staff (19) & (3) | 99 | 1.2 | 10 | 0.1 |
| (c) Additional clerical and other support staff (129) & (44) | 166 | 2.0 | 63 | 0.6 |
| (d) Additional supplies, services and travel costs | 165 | 2.0 | 70 | 0.7 |
| 4. Other increases | | | | |
| (a) Contingency | 4 | - | 5 | - |
| (b) Additional equipment replacement | 16 | 0.2 | 67 | 0.7 |
| 5. Reduction in programs | | | | |
| (a) Senior staff (1) and support costs | (108) | (1.3) | - | - |
| (b) Reduced supplies, services and travel | (228) | (2.7) | - | - |
| **1978 and 1979 Budget** | 10,059 | 20.8 | 11,912 | 18.4 |

the global inflation figures shown in the previous table are as follows:

| | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|
| Staff costs | 12.3% | 11.4% | 9.2% | 9.2% |
| Supplies and services | 12.7% | 11.9% | 8.2% | 8.2% |
| Travel | 11.5% | 12.7% | 8.9% | 9.2% |
| Gasoline | 58.0% | 49.0% | 20.0% | 20.0% |

3. (a) The following additional senior staff positions are proposed for 1978 and 1979:

| | | |
|---|---|---|
| 1978— | *Beans:* | Agronomy (one-half man)<br>Agronomy/Training |
| | *Beef:* | Soil Microbiology<br>Legume Agronomy<br>Pasture Development Agronomy |
| | *Cassava:* | Breeding<br>Soils (one-half man) |
| | *Germplasm:* | Physiologist |
| | *Library and Information Services:* | Coordinator, Public Inf. |

In addition, the Special Studies senior staff position previously projected to be eliminated in 1978 is now to be continued.

3. (b) A total of 19 in 1978 and 3 in 1979 additional scientific and supervisory level positions are proposed. Of these, 17 are for additional associates and assistants in research programs and units, three are in international cooperation activities and two are in administration.

3. (c) A total of 129 in 1978 and 44 in 1979 additional clerical and other support staff are proposed. Of these 166 are for research activities, four for international cooperation activities and three for administrative and general operating units.

3. (d) These increases are for the additional costs associated with the increase in senior staff.

4. (a) A contingency amounting to 1 percent of the total budget has been included.

4. (b) The estimated cost for the replacement of equipment in 1978 is $16,000 more than in 1977 and a further $67,000 more in 1979.

5. (a) The elimination of the position for Engineering in the Rice Program together with its support staff and other costs gives a reduction of $108,000 in 1978.

5. (b) Substantial reductions have been made in supplies, services and travel for many of the programs. These reductions are based, for the most part, on our experience in 1976.

Upon the recommendation of the CGIAR Review Committee and the request of the Secretariat, CIAT is presenting this year a budget request for a two year period—1978 and 1979.

In accepting this change in procedure, CIAT's Board of Trustees noted the merits of a two-year budget, especially for forward planning by donors, but was concerned about the difficulties that CIAT might encounter. Of particular concern was the timing of the recent TAC Quinquennial Review of CIAT, whose report will not be finalized for some time, and the substantial effect which differing inflation and devaluation rates can have on expenditures.

It was pointed out that the Consultative Group has good mechanisms for solving problems which arise during implementation of a budget and since a two-year budget is still an experiment it should be expected that these mechanisms would be more flexible than for a one-year budget.

No changes have been made to this budget for recommendations which might result from the report of the TAC Quinquennial Review. If changes are recommended and accepted by CIAT's Board of Trustees, then they will be included in a revision which will be presented to the Consultative Group in 1978.

# Summary of Achievements

The achievements on these pages represent some of the most exciting research findings and noteworthy developments of 1976 within CIAT's research and international cooperation programs.

## Beans

Extensive experimentation at CIAT on maize-bean intercropping systems and evaluations of suitable bean germplasm have produced bean yields of 2.1 ton/ha of dry beans in association with 4.9 ton/ha of maize. Under fertile soil conditions such as are found in Colombia's Cauca Valley (where CIAT is located), yields of 1.5 ton/ha of beans and 3.5 ton/ha of maize should be possible in commercial systems. More importantly, testing of intercropping systems on small farms in one area of Colombia showed that yields from traditional systems can be significantly improved using only limited additional inputs.

Nitrogen fixation rates as high as 40 kilograms of nitrogen fixed per growing season were obtained when specific varieties of beans were inoculated with efficient strains of *Rhizobium* in favorable ecologies. Climbing cultivars such as Cargamanto have consistently been higher in nitrogen fixation than have bush cultivars, the differences apparently being related to different patterns of carbohydrate storage and distribution. A hybridization program has been initiated to breed for improved nitrogen fixation in commercial cultivars.

A detailed catalog of 781 promising cultivars each evaluated for 20 to 50 features was published and distributed to provide information to breeders and other interested client cooperators.

The first international bean yield and adaptation nursery (IBYAN) was established in 1976 and 128 requests for the trials were received from 20 countries in Latin America and from Europe, Asia and Africa. Seventy-six trials were distributed, most for planting in late 1976. The second international bean rust nursery (IBRN) was tested at 14 locations in 1976. Analysis of results from the first collaborative nursery showed three cultivars resistant to rust at all six testing locations. Two of the three cultivars, P599 and P717, are currently used as primary resistance sources for rust in breeding programs.

Building on work across all disciplines, the program has defined four ideotypes for beans to be developed and bred. The four will provide types for all possible conditions encountered in Latin America where beans are commonly grown under varying conditions. Type *A* will be for short growing seasons and high planting densities; *B* will be for high-yielding commercial conditions; *C* will be designed for varying seasonal conditions and for limited inputs and low technology; and, type *D* will be compatible in mixed cropping conditions, especially with maize.

## Beef

In continuing work to find and develop forage legumes adapted to acid and infertile soils areas where this program is concentrating its efforts, three important accomplishments were made.

First, *Stylosanthes guyanensis* ecotypes have been found which, because of their fine-stemmed characteristics, are more resistant to stemborers and anthracnose than the more common woody types. These

promising accessions will be evaluated for other agronomic features.

A free-seeding perennial *S. capitata* accession was found to be tolerant to high exchangeable aluminum and low available soil phosphorus, both characteristics of poor allic soil areas. This accession also shows reasonable resistance to anthracnose and stemborers.

Among other genera of promising forage legumes, species of *Zornia, Desmodium* and *Macroptilium* adapted to allic soils and demonstrating some resistance to diseases and pests have been found.

In work with forage grasses, one promising introduction from northern Nigeria, *Andropogen guyanus*, was chosen for intensive testing. It possess major advantages of having excellent tolerance to poor allic soils, in spreading naturally and in resisting fire.

Evaluations of *Rhizobium* strains in CIAT's collection revealed that two isolated from *Stylosanthes* are much superior to the common, commercial culture. Both strains produced much more vigorous growth of *Stylosanthes* plants.

Animal health studies have indicated that cattle trypansomiasis *(T. vivax* and *T. evansi)* are more widely distributed in tropical Central and South America than has been believed. In some areas the diseases have a significant economic impact.

Investigations in the ecology of cattle ticks showed that their numbers are reduced in certain improved pasture species (especially in molasses grass), compared with their numbers in native grasses.

## Cassava

Cassava line M Col 1684 has shown exceptional stability for yield and produced more than 50 ton/ha at CIAT, 44 ton/ha in Caribia and 36 ton/ha in Carimagua. These locations provide a wide range of tropical conditions: pH, 4.5-7.8; temperatures, 24-28°C; and fertility from low to high.

High yields of about 36 ton/ha at Carimagua from applying medium levels of fertilizer confirm the excellent potential of cassava for low fertility conditions where most other food crops require considerably more inputs.

Improved cassava lines from CIAT continued to perform well and promise exciting yield increases. In Colombia, the national average yield is about 8 ton/ha but local lines grown with improved cultural practices and minimal inputs produced 16 ton/ha while the best CIAT lines with improved cultural practices averaged 28 ton/ha.

A simple cultural method was developed to control the "frog skin" disease, about which little is known. The method is based on using sanitary planting materials.

Associated cropping systems with beans and cassava were shown to produce as much as 85 percent of the normal monoculture yields for both crops when the two were planted on the same date.

## Rice

Based on results of regional trials, lines 4461 and 4421 which were developed in the cooperative CIAT-ICA breeding program were selected and released as varieties CICA 7 and CICA 9, respectively. Furthermore, six promising lines were distributed to national rice programs in the region. Of these six, line 4444 was released as variety INIAP 7 in Ecuador and line 4422, a sister line to CICA 9, was named and released as Tikal 2 by ICTA in Guatemala.

A method of multiplying small amounts of seeds was developed to increase basic seed of the two new varieties. Fifty-one tons of seed of CICA 9 was produced from 150 kilograms of breeders' seed, while 86.5 tons of CICA 7 were produced from 300 kilograms of CICA 7 seed.

## Maize

Additional cooperative efforts in maize development work between CIMMYT and CIAT began in May 1976 with the formal beginning of the Regional Andean Maize Unit, based at CIAT. The first CIMMYT staff member arrived in May and the second team member began work at CIAT in

January 1977. The unit will cooperate with maize scientists in Bolivia, Colombia, Ecuador, Peru and Venezuela.

## Training and Conferences

This program's strategies and actions were redirected during 1976 to decentralize training activities and place these functions more into the various commodity programs. Also, efforts were initiated to produce a wide variety of improved training materials to be used in CIAT and for eventual distribution within Latin America.

The program administered several highly successful training activities in 1976, including a one-month course in practical aspects of cassava production, a six-month course in swine production, a four-month rice production internship, and a two-month field exercise in beef cattle epidemiology.

## Library and Information Services

The documentation center of the CIAT Library increased its efforts in processing and distributing abstracts in cassava, beans and agricultural economics for Latin America. Three volumes of abstracts (one in each field) were published during 1976.

# Bean Program

## RESOURCES
## CORE

| Personnel | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Soil Microbiology *P. Graham* (Leader) | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.5 | 2.0 | 2.0 | 4.0 | 10.5 | 14.0 | 15.0 | 29.0 |
| Physiology *D. Laing* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 15.8 | 16.0 | 15.0 | 31.0 |
| Breeding *S. Singh* | 0.6 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 11.0 | 10.0 | 10.0 | 20.0 |
| Breeding *S. Temple* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 10.2 | 9.0 | 10.0 | 19.0 |
| Pathology *G. Gálvez* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 10.0 | 10.0 | 10.0 | 20.0 |
| Pathology *H. Schwartz* | 0.9 | 1.0 | 1.0 | 2.0 | 2.0 | 1.8 | 2.0 | 2.0 | 4.0 | 9.2 | 9.0 | 9.0 | 18.0 |
| Entomology *A. van Schoonhoven* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 12.8 | 13.8 | 13.0 | 26.8 |
| Agronomy *C. Francis* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 4.7 | 2.0 | 2.0 | 4.0 | 22.0 | 12.0 | 12.0 | 24.0 |
| Agronomy/Training *N. N.* | - | 1.0 | 1.0 | 2.0 | 2.0 | - | 2.0 | 2.0 | 4.0 | - | 11.5 | 12.0 | 23.5 |
| Agronomy *N. N.* | - | 0.5 | 1.0 | 1.5 | 2.0 | - | 2.0 | 2.0 | 4.0 | - | 6.0 | 6.0 | 12.0 |
| Agronomy *N.N.* | - | - | - | - | 2.0 | - | - | - | - | - | - | - | - |
| Fertility Agronomist* *R. Howeler* | 0.5 | | | | | 1.0 | | | | 6.0 | | | |
| Economics *J. Sanders* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.5 | 3.0 | 5.5 | 2.0 | 4.2 | 5.7 | 9.9 |
| Breeding *N. N.* | | | | | 1.5 | | | | | | | | |
| | 9.0 | 10.5 | 11.0 | 21.5 | 25.5 | 22.0 | 22.5 | 23.0 | 45.5 | 109.5 | 115.5 | 117.7 | 233.2 |
| Vacancy factor | | 0.2 | 0.2 | 0.4 | 0.5 | | 1.4 | 1.4 | 2.8 | | 9.0 | 9.0 | 18.0 |
| | 9.0 | 10.3 | 10.8 | 21.1 | 25.0 | 22.0 | 21.1 | 21.6 | 42.7 | 109.5 | 106.5 | 108.7 | 215.2 |

* It is planned that Dr. Howeler will become full-time in Cassava as from 1/1/78.

## Direct Costs

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increased 1978/1977 | % Increased Total 1978/79 / Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 609,789 | 789,262 | 822,416 | 846,408 | 1,668,824 | 4 | 19 |
| Supplies | 57,492 | 70,385 | 52,100 | 52,100 | 104,200 | (26) | (19) |
| Services | 3,269 | 39,820 | 23,000 | 25,000 | 48,000 | (42) | 11 |
| Travel | 24,841 | 73,090 | 50,000 | 53,000 | 103,000 | (32) | 5 |
| Equipment Replacement | 2,214 | 22,000 | 21,000 | 30,000 | 51,000 | ( 5) | 111 |
| | 697,605 | 994,557 | 968,516 | 1,006,508 | 1,975,024 | ( 3) | 17 |
| Capital — Equipment | 46,960 | 24,500 | 33,000 | 33,000 | 66,000 | 35 | ( 8) |

## BUDGET CHANGES

The bean program in 1978 will level at 11 senior scientists. This is an increase of 0.5 man-years over projected levels for 1978, and is 1.5 man-years more than the 1977 level. Both changes strengthen the agronomy and international testing aspects of the program.

In 1975 CIAT agreed to coordinate a Latin American bean research network. This included multilocation testing of promising disease-resistant and yield lines, as well as germplasm supply, documentation and technical assistance support to national programs. In 1975 and 1976 these activities were funded separately, while in 1977 all costs except those of the scientist responsible for coordinating the network activities and multilocation testing reverted to core funds. With the termination of the special funds for the project in 1977, this scientist is now also transferred to the core staff. This is in agreement with both the original CGIAR proposals and with budget estimates presented to the CIAT Board of Trustees in 1976.

The budget also replaces 0.5 man-years of soil science input with an additional agronomist position. This change supports the evaluation for field and agronomic traits of the many advanced generation hybrids being produced by the program and will assist the transfer of materials to national programs as rapidly as possible. Budget economies permit this change without additional cost to the core program. Institution of country responsibilities for each bean team scientist has permitted considerable reduction in travel costs while supply and service needs have also moderated.

It is anticipated that by 1980 the program will have germplasm material available of species other than *Phaseolus vulgaris*. Agronomic and disease resistance studies on these materials will have been completed using special project funds (see comments below on special projects) and it is anticipated that breeding activities can be initiated in the species *P. lunatus* and *P. acutifolius*. For this a third breeder is projected, starting in 1980.

An agronomist responsible for collaborative activities between CIAT and Central American bean workers, initially funded through the UNDP special project, is projected to be transferred to core funding in 1980.

## PROGRAM COMMENTARY

The bean program objective is to increase the yield and productivity of dry beans *(P. vulgaris)* in Latin America. This goal must be achieved despite the fact that yields have not changed appreciably in the previous 20 years, and that much bean production occurs on small holdings where the farmer's ability to supply technical inputs is limited by his economic circumstance. Thus, while maximum yields in experimental fields at CIAT range from

3-5 ton/ha in a 100-day crop, and while progressive farmers frequently obtain 2-3 ton/ha yields under conditions of large scale production, the yield average for the region remains close to 600 kg/ha.

The major difficulty is the many diseases and insects attacking the crop. Given the high yields already possible under controlled conditions, as its short-term strategy the program has decided to concentrate more on incorporating disease resistance into high-yielding germplasm selections and nationally important varieties. Emphasis in breeding for resistance has been assigned to bean common mosaic virus, rust, anthracnose and angular leaf spot among the diseases and to *Empoasca* among insects. The program recognizes the importance of bacterial blight and golden mosaic disease in the Americas, but does not yet have reliable resistance sources or methodologies developed which would permit successful breeding programs to be initiated. By incorporation of resistance to the major insects and pathogens, in less than five years it is expected to have materials yielding 2.0-2.5 ton/ha under minimal chemical protection.

Breeding for yield increases has been initiated as a longer-term goal, recognizing that many different cultural systems are used for bean production. Four main areas for concentration have been identified.

1. Large scale production under well-watered or irrigated conditions where neither inputs nor length of season limit yield.
2. The short season and commonly low fertility growing conditions found in areas of Central America.
3. The associated cropping situation where climbing beans are associated with other crops, and commonly maize.
4. The variable growing season situation under which plants would require homeostatic mechanisms allowing them to maximize yield under extremely variable rainfall conditions.

Yield goals from 2-4 ton/ha in varieties which are already disease-resistant have been set according to length of growing season and growth conditions. In yield breeding, as in disease and pest work, emphasis is given, wherever possible, to low-cost methods of production (i.e. nitrogen fixation rather than fertilization).

Given the multiplicity of grain size and color preferences in Latin America the program does not expect to produce many finished varieties, but rather to concentrate on passing materials to national program staff at as early a generation as is consistent with their ability to handle materials. Despite the youth of the CIAT program, extensive international yield trial testing is already under way and elite nursery trials are planned for 1977. This emphasis on screening within national programs has forced the bean team to intensify already active training programs and to develop extremely close coordination with each national group.

The program has already received many requests for germplasm and technical assistance from African and Asian countries, and international yield trials were forwarded to six of these countries during 1976. While major activity is currently centered in Latin America, budget projections allow for more intensive collaborative activities in Africa, beginning in 1979.

## SPECIAL PROJECTS

Funds have been requested from UNDP for an integrated training and international cooperation project which includes an international cooperation expert for beans. We have been assured that the project will be approved in the very near future. The manpower and other resources requested in the proposed project are as follows:

| | 1978 | 1979 | CIAT Core Staff Input per annum |
|---|---|---|---|
| Senior Staff | 1.0 M-Y | 1.0 M-Y | 0.05 M-Y |
| Clerical | 1.0 M-Y | 1.0 M-Y | |
| Personnel Costs | $50,000 | $42,000 | |
| Supplies & Travel | 15,000 | 16,000 | |
| Vehicle | 6,000 | | |
| Overhead | 11,000 | 9,000 | |
| | $82,000 | $67,000 | |

Discussions have been held with the government of Belgium regarding a collaborative project between the University of Gembloux and CIAT, to work in the areas of germplasm evaluation, flower physiology and interspecific hybridization of a range of *Phaseolus* species. The project involves one scientist stationed at CIAT with support personnel and other costs totalling about $50,000. Virtually no core senior staff support would be needed except that required for administrative matters.

Not included here are special projects with bilateral funding for personnel situated in specific countries (i.e. AID-funded bean staff for ICTA, Guatemala) or projects which might materalize in the future (i.e. for Brazil and East Africa).

# Beef Program

## RESOURCES
### CORE

**Personnel**

| | Man-years Clerical & Other | | | | | Man-years Scient. & Super. | | | | Man-years Senior Staff | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Leader<br>*P. A. Sánchez* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.5 | 1.5 | 2.0 | 3.5 | 5.8 | 5.5 | 7.0 | 12.5 |
| Plant Exploration<br>*R. Schultze-Kraft* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.8 | 2.0 | 2.0 | 4.0 | 6.3 | 7.5 | 8.0 | 15.5 |
| Legume Breeding<br>*K.L. Sayre* | 0.3 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 2.0 | 2.0 | 4.0 | 3.8 | 9.0 | 14.0 | 23.0 |
| Legume Agronomy<br>*B. Grof* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 11.5 | 25.0 | 27.0 | 52.0 |
| Legume Agronomy<br>*N. N.* | - | 0.5 | 1.0 | 1.5 | 2.0 | - | 1.0 | 2.0 | 3.0 | - | 3.8 | 6.5 | 10.3 |
| Legume Agronomy*<br>*N. N.* | - | - | - | - | 2.0 | 0.5 | 1.0 | 1.0 | 2.0 | - | - | - | - |
| Grass Breeding<br>*N. N.* | - | 0.5 | 1.0 | 1.5 | 2.0 | - | 1.0 | 2.0 | 3.0 | - | 4.0 | 9.0 | 13.0 |
| Grass Agronomy<br>*C. A. Jones* | 0.6 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 2.0 | 2.0 | 4.0 | 4.0 | 7.5 | 10.5 | 18.0 |
| Seed Production<br>*J. E. Ferguson* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 11.3 | 15.5 | 17.0 | 32.5 |
| Plant Pathology<br>*N. N.* | 0.3 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 2.0 | 2.0 | 4.0 | 3.0 | 7.0 | 9.0 | 16.0 |
| Soil/Plant Nutrition<br>*N. N.* | 0.4 | 1.0 | 1.0 | 2.0 | 2.0 | 0.8 | 1.5 | 2.0 | 3.5 | 5.0 | 9.5 | 9.2 | 18.7 |
| Soil Microbiology<br>*J. Halliday* | 0.5 | 1.0 | 1.0 | 2.0 | 2.0 | 1.5 | 1.5 | 2.0 | 3.5 | 4.5 | 5.3 | 8.5 | 13.8 |
| Pasture Dev. Agronomy**<br>*J. M. Spain* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.5 | 2.0 | 2.0 | 4.0 | 10.8 | 10.2 | 11.7 | 21.9 |
| Pasture Dev. Agronomy***<br>*N. N.* | - | 1.0 | 1.0 | 2.0 | 2.0 | 0.5 | 1.0 | 1.0 | 2.0 | - | 6.3 | 10.2 | 16.5 |

* This position will be funded by UNDP through 1979.
** Stationed at Carimagua Station in the Colombian Llanos.
*** Stationed EMBRAPA's Cerrado Station, Brasilia.

(Continued)

(Continued)

## Personnel

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pasture Utilization | | | | | | | | | | | | | |
| *O. Paladines* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.8 | 2.0 | 2.0 | 4.0 | 9.0 | 10.2 | 12.8 | 23.0 |
| Animal Mgmt. | | | | | | | | | | | | | |
| *I. Kleinheisterkamp* | 0.9 | 1.0 | 1.0 | 2.0 | 2.0 | 1.7 | 2.0 | 2.0 | 4.0 | 5.8 | 7.5 | 9.0 | 16.5 |
| Animal Science | | | | | | | | | | | | | |
| *C. P. Moore* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 1.5 | 2.0 | 3.5 | 3.5 | 6.2 | 8.8 | 15.0 |
| Animal Health | | | | | | | | | | | | | |
| *E. Aycardi* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 2.0 | 3.0 | 5.0 | 7.0 | 8.5 | 9.5 | 18.0 |
| Economics | | | | | | | | | | | | | |
| *G. Nores* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.7 | 3.0 | 3.0 | 6.0 | 2.0 | 2.8 | 3.0 | 5.8 |
| Training Agronomy | | | | | | | | | | | | | |
| *L.E. Tergas* | 0.3 | 1.0 | 1.0 | 2.0 | 2.0 | - | 2.0 | 2.0 | 4.0 | 6.5 | 8.0 | 8.8 | 16.8 |
| Vet. Pathology | | | | | | | | | | | | | |
| G. Morales | 1.0 | 0.5 | - | 0.5 | - | 2.0 | 1.0 | - | 1.0 | 6.0 | 1.5 | - | 1.5 |
| Vet. Epidemiology | | | | | | | | | | | | | |
| *E. Wells* | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - |
| | 13.6 | 18.5 | 19.0 | 37.5 | 40.0 | 25.3 | 36.0 | 40.0 | 76.0 | 105.8 | 160.8 | 199.5 | 360.3 |
| Vacancy Factor | | 0.4 | 0.4 | 0.8 | 0.8 | | 2.2 | 2.4 | 4.6 | | 12.5 | 15.6 | 28.1 |
| | 13.6 | 18.1 | 18.6 | 36.7 | 39.2 | 25.3 | 33.8 | 37.6 | 71.4 | 105.8 | 148.3 | 183.9 | 332.2 |

## Direct Costs

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 663,507 | 1,054,108 | 1,350,501 | 1,455,554 | 2,806,055 | 28 | 63 |
| Supplies | 74,200 | 159,185 | 122,860 | 149,000 | 271,860 | (23) | 16 |
| Services | 17,324 | 33,035 | 50,000 | 36,000 | 86,000 | 51 | 71 |
| Travel | 75,820 | 132,600 | 142,000 | 152,000 | 294,000 | 7 | 41 |
| Equipment Replacement | 295 | 33,000 | 35,000 | 54,000 | 89,000 | 6 | 167 |
| | 831,146 | 1,411,928 | 1,700,361 | 1,846,554 | 3,546,915 | 20 | 58 |
| Capital — Equipment | 27,905 | 34,600 | 67,000 | 60,000 | 127,000 | 94 | 103 |

## BUDGET CHANGES

The change in objectives of the Beef Program approved by the Board of Trustees in April 1976 began to be implemented in late 1976 with the arrival of new senior staff. The budgeted senior staff positions for 1978 are one more than previously projected because of the transfer of the beef training position from Training and Conferences to the Beef Program in order to implement the policy that training be an integral part of CIAT's major programs.

The scope and location of some other vacant positions has been redefined in order to fill in missing gaps and provide a better integrated team approach. The Beef Program is expected to reach its maximum size of 20 core-funded senior staff by 1980.

## PROGRAM COMMENTARY

Beef cattle production is one of the most important agricultural enterprises in Latin America and a major source of protein for all economic strata of its 300 million people. The per capita beef consumption in Latin America reached 21 kg/year in 1975, about 10 times higher than that of developing areas of Africa and Asia. About two-thirds of Latin America's beef is produced in its tropical regions where 73 percent of its cattle population lives. The annual productivity per head of cattle in tropical America (24 kilograms of beef) is about two-thirds of the productivity in temperate South America (41 kilograms) and about one-fourth of the productivity in the United States (86 kilograms).

The technology gap reflected in these figures is more acute when one considers the rapidly growing demand for low-cost beef, and the beef production potential of the vast areas of acid, infertile soils presently under savanna (300 million hectares) and forest (550 million hectares) vegetation. These regions together encompass about half of tropical America's land surface and are characterized by high annual rainfall with a dry season of varying duration and intensity, good soil physical properties, but extremely low native soil fertility and poor infrastructure. The paramount barrier preventing beef production increases in these regions is inadequate year-round forage caused by the severe soil and water stresses.

As population pressures increase it is unlikely that beef production in the fertile, high-base status soils of tropical America will be able to compete with crop or milk production, while in the vast acid, infertile soil areas just the opposite occurs. In mid-1976 CIAT's Board of Trustees directed that the program concentrate its efforts on increasing production in acid, infertile soil areas with primary emphasis on overcoming the nutritional gap.

### Program Objective

The objective of the Beef Program is to develop and transfer effective technology for increasing beef production in acid, infertile soils of tropical America, primarily through improved year-round forage production.

The expected result of the program is the development of improved, year-round pastures both in terms of quantity and quality, complemented by economically viable animal management and health practices. The national research and extension institutions are the clients, the beef producers the users and the consumers the beneficiaries. Hence, the goal is to benefit consumers through increasing production leading to lower prices of beef in tropical America.

### Research Strategy

The strategy for developing the technology involves a sequence of steps conducted by an interdisciplinary team of scientists, taking advantage of the knowledge gathered previously at CIAT or elsewhere.

The plant exploration agronomist collects different ecotypes of pasture grasses, legumes and associated rhizobia not only from the acid soil areas of tropical America, but also from Africa and Asia in cooperation with other institutions. These ecotypes are multiplied at CIAT headquarters and evaluated for tolerance to key diseases and insects, high aluminum saturation, low available phosphorus, and for growth habit and yield potential by several agronomists, the plant pathologist, forage entomologist (visiting scientist) and the soil-plant nutrition specialist.

Promising material is then grown at the Santander station near CIAT headquarters and observed in the field while seed is multiplied by the seed production specialist and an estimate of *in vitro* digestibility is measured by the forage utilization specialist. The rhizobium inoculation requirements are identified by the soil microbiologist for promising legume ecotypes under acid soil conditions.

The most promising grass and legume ecotypes are then grown in pure stands and in mixtures, and screened

for dry matter production, nutritional quality, compatibility and tolerance to water stress by the agronomist, the forage utilization and the soil-plant nutrition specialists. The latter then establishes the nutrient requirements under field conditions. This stage is carried out at three research stations representative of low, medium and high soil and water stress, which together provide a range of conditions characteristic of the impact area. The main properties of these three stations are:

| | Low Stress (Santander de Quilichao) | Medium Stress (Carimagua) | High Stress (CPAC, Brasilia) |
|---|---|---|---|
| Soil Order | Ultisol | Oxisol | Oxisol |
| Annual rainfall (mm) | 1,600 | 1,734 | 1,580 |
| Months of dry season | 2 | 4 | 6 |
| Available soil $H_2O$ (%) | 18 | 13 | 9 |
| Aluminum saturation (%) | 64 | 82 | 77 |
| P fixation (ppm) | 600 | 300 | 700 |
| Pests and diseases | low | high | low |

The promising ecotypes are then tested under a wide variety of ecological conditions in regional trials throughout the impact area and in a limited number of fertile soil sites and an International Tropical Forage Evaluation Network in cooperation with national institutions. Both forage production and persistence under grazing are evaluated at this stage.

Systems for establishing and maintaining improved pastures will be developed at medium and high stress locations. The most promising pastures are tested in terms of animal performance by the animal scientists at these locations. Outstanding grass or legume cultivars will be released after large-scale seed multiplication.

Individual components of animal management and health, such as early weaning, seasonal breeding and health-nutrition interactions are studied by animal management specialists and veterinarians at different levels of nutrition, provided by improved and unimproved pastures. All soils, pasture, animal management and health components will then be put together as beef production systems in cooperation with national institutions. The economist participates in the design of pasture establishment and forage utilization research, evaluates their potential profitability and analyses the individual production components.

The focus on acid infertile soils and the complexity of the program requires a greater integration of research, outreach and training activities than that of the other major commodity programs at CIAT. Because of the fertile, high-base status soils at Palmira, most of the field research has to be conducted away from CIAT headquarters. Initial germplasm evaluation, up to the point of pasture evaluation under grazing pressure, can be conducted at the nearby Santander sub-station, a low stress site within the range of acid, infertile soils. Verification of promising germplasm and more advanced agronomic and animal research must be conducted under real savanna conditions. Two major sites are proposed in this budget: a jointly-managed ICA station in the Colombian Llanos as a medium stress site, and the Cerrado Center near Brasilia as a high stress site in cooperation with EMBRAPA. CIAT will station two or more of its core senior scientists at these locations in order to conduct research that cannot be done in the Cauca Valley. The entire Beef Program will remain closely integrated by means of effective communications and travel between the major research sites. Thus, research and outreach will be carried out by all Beef Program senior scientists.

## Outreach Strategy

The outreach strategy *per se* involves four additional components. A detailed survey of the program's impact area is proposed in order to characterize the area in terms of climate, soils, topography, vegetation, infrastructure, pastures, beef production, animal health problems, and economics. This two-year study will involve a visiting scientist and two consultants plus the time of certain core senior staff. This study will identify which areas are likely to be more immediate beneficiaries of the research and will permit planning of outreach activities accordingly. It will also sharpen the focus of the research through increased knowledge of beef production problems in the region.

Although the acid, infertile savannas are the main initial impact area, medium term projections made herein show that the beef production potential of the larger forested regions is great. Proper technology for the forested areas will assure ecologically-sound agricultural development where land is being cleared, and will benefit the already significant cattle population in the Amazon region. Germplasm evaluation conducted at Santander is applicable to jungle regions as well as to savannas.

The training strategy is also integrated with research and outreach. Production courses will provide training on practical aspects of soil-plant-animal relationships according to the program objectives. These courses will be open to specialists working in intermediate soil fertility regions who are interested in improving forage production and animal nutrition. Postgraduate internships will be expanded considerably, with emphasis on thesis research conducted under actual savanna or jungle conditions. An expected outcome of the training thrust is the development of a cadre of future collaborators in the national institutions of tropical America.

Several publications and symposia are planned for 1978 and 1979 in order to bring together the relevant documentation on the present knowledge of beef production technology in acid infertile soils. A major symposium on Tropical Forages in Latin America is planned for 1978, as a means of catalyzing a dynamic research network. A second symposium on Beef Management in Latin America is planned for 1979. The proceedings of both will be published in three languages. The relevant literature will be assembled as a publication "Abstracts on Tropical Pastures and Beef Production". A field manual on tropical pasture problems and a training manual is projected to support field level workers.

## SPECIAL PROJECTS

A proposal has been submitted to IDRC by IFDC for a collaborative research project on phosphorus to be carried out mostly at CIAT. The project includes a soil fertility expert and a soil chemist at the senior staff level. Although the project will be placed organizationally in the Beef Program, the work will also relate to other CIAT commodities.

The objectives of the project are: to evaluate the effectiveness of sources and methods of application of phosphate fertilizers on soils of tropical and subtropical Latin America; to determine the forms and availability of the reaction products of these fertilizers in soils as related to their initial and residual effectiveness; and to establish criteria for applying the results of the first two objectives to different soils and crops at various locations by conducting field experiments on selected soils throughout Latin America.

Details of the manpower and other resources requested for the CIAT portion of this project are as follows:

| | Year 1 | Year 2 | Year 3 | CIAT Core Staff Input per annum |
|---|---|---|---|---|
| Senior Staff | 2.0 M-Y | 2.0 M-Y | 2.0 M-Y | 1 man-month |
| Scientific & Supervisory | 2.0 M-Y | 2.0 M-Y | 2.0 M-Y | |
| Clerical & Other | 7.0 M-Y | 7.0 M-Y | 7.0 M-Y | |
| Personnel Costs | $105,200 | 115,700 | 127,300 | |
| Supplies & Services | 5,000 | 5,500 | 6,000 | |
| Travel | 7,000 | 7,700 | 8,500 | |
| Equipment | 7,000 | 7,700 | 8,500 | |
| Indirect expenses | 39,800 | 43,400 | 48,700 | |
| | $164,000 | $180,000 | $199,000 | |

Funds have been requested from UNDP for an integrated training and international cooperation project which includes an international cooperation expert for forages. This person will be a legume agronomist stationed in Brasilia. We have been assured that the project will be approved in the very near future. The manpower and other resources requested are as follows:

| | 1977 | 1978 | 1979 | CIAT Core Staff Input per annum |
|---|---|---|---|---|
| Senior Staff | 0.5 M-Y | 1.0 M-Y | 1.0 M-Y | 0.05 M-Y |
| Clerical | 0.5 M-Y | 1.0 M-Y | 1.0 M-Y | |
| Personnel Costs | $25,000 | $40,000 | $42,000 | |
| Supplies & Travel | 8,000 | 15,000 | 16,000 | |
| Vehicle | 5,000 | | | |
| Overhead | 5,500 | 9,000 | 9,500 | |
| | $43,500 | $64,000 | $67,500 | |

A third special project involves the study of factors affecting reproductive efficiency of beef cattle in our impact area. This project has been approved in principle by the German Federal Republic, who will fund it. The manpower and other resources requested are as follows:

| | |
|---|---|
| Animal scientists (2) | 6.0 M-Y |
| Agricultural economist (1) | 2.0 M-Y |
| Personnel Costs | $215,000 |
| Supplies and Services | 30,000 |
| Travel | 45,000 |
| | $290,000 |

# Cassava Program

## RESOURCES
### CORE

**Personnel**

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Physiology | | | | | | | | | | | | | |
| *J. Cock* (Leader) | 1.0 | 1.0 | 1.0 | 2.0* | 2.0 | 1.7 | 2.0 | 2.0 | 4.0 | 15.3 | 16.0 | 16.0 | 32.0 |
| Breeding | | | | | | | | | | | | | |
| *K. Kawano* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.8 | 2.0 | 2.0 | 4.0 | 17.8 | 18.0 | 18.0 | 36.0 |
| Breeding | | | | | | | | | | | | | |
| *N. N.* | - | 0.5 | 1.0 | 1.5 | 2.0 | - | 0.5 | 1.5 | 2.0 | - | 5.2 | 8.5 | 13.7 |
| Pathology | | | | | | | | | | | | | |
| *J. Lozano* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.8 | 2.0 | 2.0 | 4.0 | 13.2 | 14.0 | 14.0 | 28.0 |
| Entomology | | | | | | | | | | | | | |
| *A. Bellotti* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 13.0 | 15.5 | 15.0 | 30.5 |
| Agronomy/Varietal Improvement | | | | | | | | | | | | | |
| *J. Toro* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 12.0 | 13.8 | 14.0 | 27.8 |
| Agronomy/Cultural Practices | | | | | | | | | | | | | |
| *D. Leihner* | 0.6 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | - 2.0 | 4.0 | 11.8 | 16.2 | 17.0 | 33.2 |
| Plant Nutrition | | | | | | | | | | | | | |
| *R. Howeler* | 0.5 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 1.5 | 2.0 | 3.5 | 9.0 | 14.0 | 15.5 | 29.5 |
| Economics | | | | | | | | | | | | | |
| *N. N.* | 0.2 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.5 | 3.0 | 5.5 | 3.2 | 4.3 | 4.5 | 8.8 |
| International Cooperation Spec. | | | | | | | | | | | | | |
| *N. N.* | | | | | 2.0 | | | | | | | | |
| Processing | | | | | | | | | | | | | |
| *R. Best* | 0.3 | | | | | | | | | | | | |
| | 6.6 | 8.5 | 9.0 | 17.5 | 20.0 | 14.3 | 16.5 | 18.5 | 35.0 | 95.3 | 117.0 | 122.5 | 239.5 |
| Vacancy factor | | 0.2 | 0.2 | 0.4 | 0.4 | | 1.0 | 1.1 | 2.1 | | 9.1 | 9.6 | 18.7 |
| | 6.6 | 8.3 | 8.8 | 17.1 | 19.6 | 14.3 | 15.5 | 17.4 | 32.9 | 95.3 | 107.9 | 112.9 | 220.8 |

## Direct Costs

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 / Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 450,559 | 584,129 | 692,275 | 743,242 | 1,435,517 | 19 | 39 |
| Supplies | 53,562 | 50,140 | 45,000 | 45,000 | 90,000 | (10) | (13) |
| Services | 28,022 | 33,000 | 20,000 | 27,000 | 47,000 | (39) | (23) |
| Travel | 38,680 | 59,336 | 45,836 | 45,836 | 91,672 | (23) | ( 6) |
| Equipment Replacement | 2,006 | 19,000 | 17,000 | 26,000 | 43,000 | (11) | 105 |
| | 572,829 | 745,605 | 820,111 | 887,078 | 1,707,189 | 10 | 29 |
| Capital — Equipment | 15,288 | 15,000 | 25,000 | 22,000 | 47,000 | 67 | 55 |

## BUDGET CHANGES

The basis of the cassava production technology being developed at CIAT is improved germplasm. Up to now simple breeding methods have been adequate but in the future more sophisticated methodology may be required. For example, to obtain better resistance to spider mites it may be necessary to look at related *Manihot* spp. and utilize special breeding methods to increase resistance above present levels. Similarly, efforts will be made to improve postharvest storage life and other characters such as broader based resistance to pests and diseases. For these reasons, the addition of a second cassava breeder in 1978 is considered of paramount importance to both accelerating and sustaining rapid plant improvement.

Recent results of CIAT investigations have shown that cassava can produce exceptional yields under low fertility, acid soil conditions. Moreover, varietal differences in tolerance to aluminum toxicity, a problem associated with these conditions, have been observed. Therefore, it is proposed to increase the soils/plant nutrition research from one-half to a full-time international scientist position. This will permit greatly expanding the search for lines especially adapted to these conditions.

The importance of validating new technology and the need to develop critical linkages in major growing regions provides the basis for placing outreach scientists in selected sites. The southern cone of tropical Latin America and southeastern Asia are the two most important regions for establishing cooperative relay projects. It is proposed to fund these activities through special projects; IDRC is already supporting the linkage in Asia, through a person based at SEARCA in Los Baños, Philippines.

Reductions have been made in budgeted amounts for supplies, services and travel in 1978 and 1979. These are based mainly on the spending pattern of 1976. Services are reduced because printing of some publications is provided by the special project for cassava discussed under Library and Information Services.

## PROGRAM COMMENTARY

### Importance of Cassava

Cassava in grown on 10 million hectares in the lowland tropics with an annual production of about 100 million tons. Much of this production is on small farms, in areas of poor soils and with very little modern technology. Nevertheless, the average yield of about 3.5 ton/ha/year of dry matter compares favorably with productivities of many other crops grown more intensively in the tropics.

More than 80 percent of the cassava produced is for direct human consumption; it forms the basic energy source for some 300-500 million people in the world. Although low in protein, cassava is capable of producing carbohydrates very efficiently. Recent World Bank figures show that energy deficiency is very prevalent in the diets of people in the developing world with perhaps one-fourth the world's population being energy deficient.

World production of cassava has increased slowly in the last 20 years. Most of the increase has come from an expansion of the area planted, while yields per hectare have stagnated at about the 10 ton/ha level. The potential for increasing yields and the area under cultivation is enormous. Under the fertile conditions of the CIAT farm yields of 60 ton/ha have been reached without fertilizers, fungicides or insecticides. Similarly, trials in farmers fields suggest that yields can be increased two- or three-fold by using improved varieties, comparatively simple cultural techniques and inexpensive phytosanitary practices.

Vast areas of the tropics with very poor, acid Oxisol and Ultisol soils are only used for extensive grazing. When crops are produced in these areas heavy lime and fertilizer applications are normally required. Cassava, however, appears well-adapted to these soils. Recently yields of over 35 ton/ha/year were obtained with only moderate inputs of lime and fertilizer in the eastern plains (the Llanos) of Colombia. These data suggest the exceptional potential for increased cassava production in areas presently considered non-productive. Moreover, a study made in the University of Guelph (Canada) suggests that demand for human consumption is increasing and is greater than supply. Increased cassava production above the level of human needs in a country can be readily used for animal rations.

## PROGRAM OBJECTIVES

The cassava program was initiated in late 1971 and became fully operational in 1973. Since the beginning the program objectives have been the following:

1. To develop technology, that does not require high levels of inputs, for production of high yields of cassava.
2. To make technology available to interested local and national agencies. It should be noted that great emphasis is being placed on developing technology for regions often considered marginal for agriculture due to low fertility or poor rain distribution.

### Plant Improvement

In order to obtain high yields it is essential that the varieties used must also be highly efficient. An efficient cassava plant requires a balance between root and stem growth such that it maintains a leaf area index of about 3. Furthermore, leaves with a long life help to increase efficiency. Present yields of 60 ton/ha at CIAT are still below the potential that may be reached by breeding for more efficient plant types.

Many of the cassava types in the CIAT germplasm collection have useful characters but all the desirable characters do not presently exist in any one line. The breeding section has defined the methodology for crossing and selection and is now producing lines that combine high yield potential with disease and insect resistance, high starch content, broad adaptability, long postharvest shelf life and acceptable quality. This process is slow and requires large numbers of crosses. Nevertheless, among thousands of lines observed some have shown very good yield potential with a broad range of adaptability. One line without fertilizer has yielded 50 ton/ha in the fertile CIAT conditions, 44 ton/ha in the moderate fertility, wet-dry season coast of Colombia, and, using moderate fertilizer levels, 36 ton/ha in the acid soils of the Colombian Llanos.

### Plant Protection

It is not sufficient, however, just to have an efficient plant type; it must also be protected from diseases and pests. This could be achieved by extensive use of chemical control, however, this would be neither economically nor ecologically acceptable. Therefore, control methods are based on biological control, varietal resistance and simple phytosanitary practices. High levels of varietal resistance have been found for important diseases such as superelongation and the *Cercospora* leaf spots, and for insects such as thrips. The potentially devastating bacterial blight can be eliminated by use of

clean seed and crop rotation and the hornworm can be controlled with parasites.

### Drying

The development of new production technologies makes it essential that postharvest handling for the increased production also be improved. Natural drying methods are being developed which appear to improve efficiency over traditional methods by using a modified Malaysian chipper followed by drying on inclined trays.

### Validating the Technology

The best lines developed are passed through a series of regional trials, first in Colombia and then in other countries. The trials are done with minimal inputs; for example, fertilizer is only applied on the most infertile soils and applications of fungicides and insecticides are never made to the growing plants. Cultural and phytosanitary practices developed at CIAT such as weed control, clean propagating material, optimum plant population and planting methods are utilized. Results thus far suggest that just improving these practices can double yields and that by combining these practices with improved or selected lines yields of three to four times those presently obtained are quite possible.

A transfer of new technology to other countries is based on cooperation with national agencies through: (a) training, (b) technical advice, (c) germplasm exchange, (d) conferences, and (e) publication of technical bulletins and papers.

### Training

Two intensive cassava production courses have been held at CIAT for some 50 agronomists from nine Latin American countries. More than 60 percent of the course contents were on practical aspects of production including the evaluation of production methods used by farmers in different zones of Colombia.

Long-term training in research is given to students from Latin America, Africa and Asia. Groups are invited from each country and trained so that they can return and form effective research teams. Eight Mexicans and three Thais are now forming multidisciplinary research teams in their respective countries. Similar training plans are in progress with Brazil and Malaysia. Seven of the eight professionals at the recently formed Cassava Center in Brazil have experience at CIAT.

### Consultation

Both the Mexican and Brazilian cassava research and development programs requested technical advice on research and production strategies and CIAT staff have responded to these requests. Similarly, the Indian and Malaysian programs are in close contact with CIAT and their program directors visited CIAT for short periods in 1976.

Most national programs have not been under way for sufficient time to develop their own genetically superior material and breeding programs. As a result CIAT sent seeds and planting material to 28 countries in 1976. Regional trials using CIAT and local varieties are being established in Brazil, Ecuador, Guyana, Mexico and Venezuela. The only trial harvested to now showed a CIAT line to be the highest yielder of both fresh roots and starch.

The movement of germplasm and the methodology of these international trials was determined at a special workshop held in 1975. In 1976, cassava researchers from all over the world had the chance to meet and discuss common problems at the IV Symposium of the International Tropical Root and Tuber Crops Society, at CIAT in August.

## SPECIAL PROJECTS

In 1976 IDRC approved two projects for outreach and training over a three-year period. One is to provide funds for an outreach production specialist (coordinator) for Latin America to be based at CIAT, plus funds for two production training courses and postgraduate training. The other project is for an outreach production specialist (coordinator) for Asia, who is based at SEARCA in the Phillippines, plus funds for one production training course and postgraduate training. The following tabulation shows the manpower and other resources for these projects.

| IDRC Cassava Cooperative Research — Latin America | 1976 | 1977 | 1978 | 1979 | CIAT Core Staff Input per annum |
|---|---|---|---|---|---|
| Coordinator — *A. Castro* | - | 1.0 M-Y | 1.0 M-Y | 1.0 M-Y | 0.2 M-Y |
| Personnel Costs | - | $44,000 | $39,000 | $39,000 | |
| Travel | - | 10,000 | 10,000 | 10,000 | |
| Training | $57,000 | 45,000 | 48,000 | - | |
| Overhead | - | 18,000 | 12,250 | 16,750 | |
| Contingencies | - | 5,000 | 10,000 | 15,000 | |
| | $57,000 | $122,000 | $119,250 | $80,750 | |
| **IDRC Cassava Cooperative Research — Asia** | | | | | |
| Coordinator — *R. Obordo* | - | 1.0 M-Y | 1.0 M-Y | 1.0 M-Y | 0.2 M-Y |
| Personnel Costs | - | $46,500 | $46,500 | $46,500 | |
| Supplies & Services | - | 8,000 | 8,000 | 8,000 | |
| Travel | - | 15,000 | 15,000 | 15,000 | |
| Training | $27,000 | 117,000 | 18,000 | - | |
| Equipment | 2,000 | 2,000 | | | |
| Overhead | - | 11,000 | 13,000 | 10,500 | |
| Contingencies | - | 8,000 | 10,000 | 15,000 | |
| | $29,000 | $207,500 | $110,500 | $95,000 | |

Details of a cassava information project, also funded by IDRC, are shown in the section for Library and Information Services.

The following are possible special projects which, after suitable internal review, could be useful and desirable complements to our core program if interested donors are found.

1. A project starting in 1978 or 1979 to place a CIAT representative in Brazil to work with EMBRAPA on testing and developing appropriate technology for new CIAT lines. Costs would be on the order of $75,000 per annum with approximately 0.1 man-year per annum input of core senior staff time..

2. A project starting in 1978 or 1979 to place a CIAT representative in Central America to work on testing and developing appropriate technology for new CIAT lines. Costs would be about $75,000.

3. A project to investigate the possible role of micro-organisms in non-symbiotic nitrogen fixation and/or increased phosphorous uptake. A senior scientist stationed at CIAT with a small support staff and other inputs costing a total of about $75,000 per annum for three years would be required. Core staff input would be less than 1 man-month per annum.

4. A project to conduct cooperative research with an advanced scientific institution to investigate drought stress with a view to developing drought-tolerant lines. The project would require a senior scientist with support personnel and other costs adding to about $75,000 per annum. Core staff input would be about 0.2 man-year per annum.

# Rice Program

## RESOURCES
### CORE

**Personnel**

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Agronomy | | | | | | | | | | | | | |
| *N. N.* | 0.5 | 1.0 | 1.0 | 2.0 | 2.0 | 1.5 | 2.0 | 2.0 | 4.0 | 0.5 | 11.0 | 11.0 | 22.0 |
| Pathology | | | | | | | | | | | | | |
| *N. N.* | 0.5 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 2.0 | 2.0 | 4.0 | 3.5 | 8.5 | 11.3 | 19.8 |
| Engineering | | | | | | | | | | | | | |
| *L. Johnson* | 1.0 | - | - | - | - | 1.0 | - | - | - | 1.5 | 2.8 | 3.0 | 5.8 |
| Breeding | | | | | | | | | | | | | |
| *H. Weeraratne* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.8 | 2.0 | 2.8 | 4.8 | 11.2 | 11.7 | 12.7 | 24.4 |
| Funded by IRRI: | | | | | | | | | | | | | |
| IRRI Laison Scientist | | | | | | | | | | | | | |
| *M. Rosero* (Acting Leader) | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.5 | 2.0 | 2.0 | 4.0 | 9.3 | 9.8 | 10.0 | 19.8 |
| | 4.0 | 4.0 | 4.0 | 8.0 | 8.0 | 8.8 | 8.0 | 8.8 | 16.8 | 26.0 | 43.8 | 48.0 | 91.8 |
| Vacancy Factor | | 0.1 | 0.1 | 0.2 | 0.2 | | 0.6 | 0.7 | 1.3 | | 4.2 | 4.6 | 8.8 |
| | 4.0 | 3.9 | 3.9 | 7.8 | 7.8 | 8.8 | 7.4 | 8.1 | 15.5 | 26.0 | 39.6 | 43.4 | 83.0 |

Direct Costs

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 170,899 | 246,142 | 238,862 | 259,923 | 498,785 | ( 3) | 20 |
| Supplies | 20,642 | 21,850 | 16,000 | 17,700 | 33,700 | (27) | (21) |
| Services | 924 | 4,950 | 1,500 | 1,500 | 3,000 | (70) | (49) |
| Travel | 12,879 | 32,600 | 17,550 | 17,550 | 35,100 | (46) | (23) |
| Equipment Replacement | 539 | 10,000 | 6,000 | 10,000 | 16,000 | (40) | 52 |
| | 205,883 | 315,542 | 279,912 | 306,673 | 586,585 | (11) | 12 |
| Capital — Equipment | 4,302 | 3,000 | 14,000 | 16,000 | 30,000 | 367 | 311 |

## BUDGET CHANGES

The ongoing disease problems, the continuing need to transfer and adapt management technology, requirements for substantial quantities of breeder's seeds, and coordinating of training dictate the urgency of adding both an agronomist and a pathologist on a permanent basis. These positions are deemed more essential to advancing rice technologies in Latin America than an economist, at this stage of development. Therefore, it is proposed to utilize the present two openings in rice for an agronomist and pathologist, to make these continuing appointments, and to carry out the relevant economic studies with special project or other funding.

## PROGRAM COMMENTARY

### Objectives

The objectives of the Rice Program are to increase yields and stabilize production of rice in tropical Latin America using reduced inputs to thereby increase incentives for production and consumption by the needier segments of society.

### Strategy

The program employs a multi-phase strategy in seeking to accomplish its objectives.

1. The possibilities for further yield increases are being explored through the introduction of several widely adapted, high-yielding parents to the breeding program while simultaneously improving quality and tolerances to stresses — especially to the four most prevalent diseases and one important insect pest.

2. Four main biological factors impinging on potential yields are rice blast, "hoja blanca" and the green plant hopper, and sheath blight and leaf scald. Of these, rice blast is considered the most important disease since the fungus is able to overcome resistance to it within 2-3 years after release of a rice variety. To solve this problem, two new approaches are being tried: (a) developing of multiline varieties, and (b) combining resistant factors from several progenitors. Multiple resistance will certainly last longer than resistance derived from a single source.

Breeding for resistance to the green plant hopper *(Sogatodes oryzicola),* the primary vector of hoja blanca virus, will effect resistance to that disease. Present rice varieties possess resistance in the form of a single dominant gene derived from the IR-8 variety. However, it is entirely possible that new physiological races of the hopper will develop. Therefore, identification of additional genes for resistance and their incorporation into superior lines is planned.

Sheath blight and leaf scald diseases are considered the major constraints to rice production in Central America and several countries in South America. However, efforts to breed for resistance have not yet been initiated in this region. Three new sources of resistance identified from sheath blight nurseries are being utilized to incorporate resistance into several promising lines and varieties. Similar efforts will be carried out against leaf scald.

3. Contributions will be made to the development of new germplasm, and technology for deep-water and upland conditions will be created through the evaluation and testing of appropriate nurseries from IRRI. These would normally be first grown out at CIAT to select for acceptable qualities, to check resistance to stress and to multiply seed for widespread distribution within the region.

4. Testing advanced breeding lines and superior varieties from several sources throughout the world will be done in an extensive system of cooperative trials and disease nurseries. These materials will be brought to CIAT initially 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.

5. Most of the national programs are handicapped due to lack of trained personnel for expanding their programs. It is proposed to train a few individuals at a time from each country in rice breeding and production. On completion of their training they will become key professionals for transferring technology as well as strengthening their respective national programs.

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

7. Through the services of a visiting scientist or a postdoctoral researcher, an economic/geographic study will be made to determine the areas and ecosystems with greatest potential for future expansion of rice production. The Board of Trustees plans to review the results of this study at its 1978 annual meeting and may add to or modify the scope and strategy of the Rice Program to include work in such areas as upland or floating rice, if the study shows that these should be given high priority for attention.

### Achievements Timetable

The accomplishment of important achievements in the Rice Program is expected to follow this schedule. In **1978:** release of a new variety with better performance and quality than previous varieties. Fifty tons of seed of this variety will be made available for distribution to national programs. Also in **1978:** Training of 10-20 technicians annually from national programs will be initiated. In **1981:** Suitable upland varieties, deep-water varieties and special varieties for localized conditions of Latin America are expected to be identified from the International Testing Program, within a period of five years. Also in **1981:** Multiline varieties as well as varieties with multiple resistance to blast are expected to be available within a period of five years.

## SPECIAL PROJECTS

Funds have been requested from UNDP for an integrated training and international cooperation project which includes an international cooperation expert for rice. We have been assured that the project will be approved in the near future. The manpower and other resources requested are as follows.

| | 1977 | 1978 | 1979 | CIAT Core Staff Input per annum |
|---|---|---|---|---|
| Senior Staff | 0.8 M-Y | 1.0 M-Y | 1.0 M-Y | 0.1 M-Y |
| Clerical | 0.8 M-Y | 1.0 M-Y | 1.0 M-Y | |
| Personnel Costs | $55,000 | $60,000 | $60,000 | |
| Supplies & Travel | 12,000 | 15,000 | 17,000 | |
| Vehicle | 5,000 | | | |
| Overhead | 8,000 | 10,000 | 10,000 | |
| | $80,000 | $85,000 | $87,000 | |

# Swine Unit

## RESOURCES
## CORE

### Personnel

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Nutrition | | | | | | | | | | | | | |
| *G. Gómez* (Leader) | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 | 6.0 | 6.0 | 6.0 | 12.0 |
| Production | | | | | | | | | | | | | |
| *J. Buitrago* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.8 | 2.0 | 2.0 | 4.0 | 5.0 | 5.7 | 6.0 | 11.7 |
| | 2.0 | 2.0 | 2.0 | 4.0 | 4.0 | 3.8 | 4.0 | 4.0 | 8.0 | 11.0 | 11.7 | 12.0 | 23.7 |
| Vacancy Factor | | | | | | | 0.2 | 0.2 | 0.4 | | 0.9 | 0.9 | 1.8 |
| | 2.0 | 2.0 | 2.0 | 4.0 | 4.0 | 3.8 | 3.8 | 3.8 | 7.6 | 11.0 | 10.8 | 11.1 | 21.9 |

### Direct Costs

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 130,678 | 137,319 | 135,461 | 135,068 | 270,529 | ( 1) | 1 |
| Supplies | 13,597 | 17,500 | 15,000 | 15,000 | 30,000 | (14) | ( 4) |
| Services | 537 | 7,000 | 5,000 | 5,000 | 10,000 | (29) | 33 |
| Travel | 5,701 | 14,530 | 10,330 | 10,330 | 20,660 | (29) | 2 |
| Equipment Replacement | - | 8,000 | 4,000 | 6,000 | 10,000 | (50) | (37) |
| | 150,513 | 184,349 | 169,791 | 171,398 | 341,189 | ( 8) | 2 |
| Capital — Equipment | - | 5,000 | 7,000 | 8,000 | 15,000 | 40 | 50 |

## BUDGET CHANGES

The Swine Production Unit will remain substantially the same during 1978-79. Progress made and the outlook for future activities will be reviewed by the Board of Trustees in 1978. One technician is added for the pilot plant for microbial protein production.

Amounts budgeted for supplies, services and travel have been reduced from the 1977 level based largely on the 1976 level of expenditures.

## PROGRAM COMMENTARY

Statistical data available in Latin America indicate that the parameters of economic importance to swine production are considerably inferior to those of countries in Europe, Asia and North America. While the swine population in Latin America represents about 10 percent of the world total, meat from pork represents only 5 percent of the world pork production. As a result, per capita pork consumption in Latin America is less than eight kilograms per year, compared with more than 10-15 kilograms in China, the USSR and Oceania, and 20-30 kilograms in the United States, Canada and Europe. In contrast, the number of pigs (0.3) per person in Latin America equals or is superior to that of the countries previously mentioned. There are several reasons for low swine productivity in Latin America. Among the most important ones are: limited economic feasibility of swine production based on conventional feedstuffs, lack of professionals and technicians trained in swine production, the large distribution of pigs at the level of small farms, marketing constraints and animal health problems.

Some of the limiting factors depend on national or regional agricultural policies and might not be solved until adequate policies to encourage swine production are implemented. To overcome some of the major constraints (for example, economic feasibility of swine production based on conventional feedstuffs), an increase in basic agricultural commodities, beyond the limit of fulfilling human nutritional needs, is required. In addition, according to results from extensive experiments being conducted at CIAT and some national institutions, there is a good possibility to improve swine production based on agro-industrial by-products (rice polishings, sugarcane molasses, residues of cassava starch factories), derived from basic commodities. Moreover, Latin American perspectives of increasing certain crops such as cassava may lead to prices low enough to consider cassava as an animal feed, notably for swine.

Most of the remaining constraints to improve swine productivity in Latin America deal with the need of transferring new technologies to swine producers. CIAT has begun to play a major role in this direction through the training of professionals involved in swine development projects throughout Latin America. Long (six months) and short (six weeks) swine production courses will be offered alternately at CIAT, with the participation of Colombian institutions working in different aspects of swine production. It is expected that approximately 100 swine production specialists will be trained at CIAT during a five-year period and that these swine specialists will constitute core groups to implement national or regional training courses and seminars, with the support of CIAT's Swine Unit scientific personnel.

The transfer of swine technology is further implemented through cooperative projects in Bolivia, Costa Rica and Peru. Adaptation of research results, training at the local level and distribution of improved breeds will be carried on in these projects. Technical assistance is also being offered to developing and on-going swine programs in other Latin American countries.

Dynamic training activities will require some limited research to try to solve the problems found during the development of swine production at the national or regional level. Selected experimental work will continue to focus on the search for practical and efficient use of agricultural by-products in swine feeding as well as for research on non-conventional feedstuffs. One approach to the latter case is the involvement of CIAT, in collaboration with the University of Guelph (Canada), in developing a fermentation process for the conversion of cassava to single-cell protein, which could be used in animal feeding in tropical countries.

# Genetic Resources Unit

## RESOURCES
### CORE

**Personnel**

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Germplasm Specialist *L. Song* | 0.5 | 1.0 | 1.0 | 2.0 | 2.0 | 2.5 | 3.0 | 3.0 | 6.0 | 9.3 | 11.5 | 13.5 | 25.0 |
| Plant Biochemistry *R. Luse* (Coordinator) | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.5 | 2.0 | 2.0 | 4.0 | 1.5 | 2.7 | 3.0 | 5.7 |
| Physiologist *N. N.* | | 0.5 | 1.0 | 1.5 | 2.0 | - | 0.5 | 1.0 | 1.5 | - | 3.0 | 6.2 | 9.2 |
| | 1.5 | 2.5 | 3.0 | 5.5 | 6.0 | 4.0 | 5.5 | 6.0 | 11.5 | 10.8 | 17.2 | 22.7 | 39.9 |
| Vacancy Factor | | | | | | | 0.3 | 0.4 | 0.7 | | 1.4 | 1.8 | 3.2 |
| | 1.5 | 2.5 | 3.0 | 5.5 | 6.0 | 4.0 | 5.2 | 5.6 | 10.8 | 10.8 | 15.8 | 20.9 | 36.7 |

**Direct Cost**

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase total 1978/79 2 x 1977 |
|---|---|---|---|---|---|---|---|
| Personnel | | 118,682 | 166,518 | 195,577 | 362,095 | 40 | 53 |
| Supplies | | 11,500 | 20,000 | 21,000 | 41,000 | 74 | 78 |
| Services | | 2,200 | 6,500 | 7,500 | 14,000 | 195 | 218 |
| Travel | | 8,530 | 8,330 | 8,730 | 17,060 | ( 2) | - |
| Equipment Replacement | | 4,000 | 4,000 | 7,000 | 11,000 | - | 38 |
| | | 144,912 | 205,348 | 239,807 | 445,155 | 42 | 54 |
| Capital — Equipment | | 16,500 | 18,000 | 15,000 | 33,000 | 9 | |

## BUDGET CHANGES

Staffing of this new unit, established in 1977, should be complete by mid-1978 and budget increases over 1977 are directly related to the addition of the physiologist for cassava storage studies and to the full staffing of the genetics and biochemistry sub-units. Specific funding has been provided for computer services, since information retrieval and multivariant analysis are especially necessary to fully utilize the valuable collections of germplasm to be stored in the unit.

## PROGRAM COMMENTARY

The basic commodity of all the International Centers is the improved germplasm upon which to establish more productive systems of farming. The Genetic Resources Unit has been charged with the responsibility of assembling, maintaining, evaluating and distributing germplasm in support of the three major crop development programs of CIAT: *Phaseolus* beans, cassava and forage legumes.

The extent of these collections will increase through the years, but by early 1977 CIAT had in its collections over 12,000 accessions of beans, 2,200 of cassava and 2,000 of forage legumes (especially *Stylosanthes, Centrosema, Desmodium* and *Microptilium*). They represent unique genetic resources that must be maintained, perhaps for centuries, in order to serve future needs in crop improvement. The unit has been established to provide an integrated set of supportive activities that will ensure full characterization and hence utilization of these germplasm resources. The physical facility being completed will be among the finest of its type in the world. The full senior staffing to be attained in 1978 will include a geneticist, a plant biochemist and a plant physiologist. The specific activities of each of these will be as follows.

### Geneticist

The geneticist has responsibility for the storage facility and for assembling, maintaining and distributing germplasm. Under his supervision, accession numbers are assigned to new materials and genetic identity and/or purity are determined. A routine activity associated with the storage facility is assessing seed viability and growing out materials to maintain adequate stocks of good quality seed. The geneticist has particular responsibility to set up a catalog system suitable for information retrieval by computer. Use of the computer to provide easy access to information on the germplasm collections is essential; rather than have a bulky, printed catalog which is rarely used, the computer will be asked to print full catalog information on those accessions having particular characteristics desired by a plant breeder. In this way each plant breeder can have that part of the germplasm catalog of special use to him.

### Biochemist

Biochemical taxonomy, also known as chemotaxonomy, is a new field of particular interest to the unit because plant enzymes (and indirectly, certain products of their activity) are a direct expression of gene action. Thus, analysis of such factors as leaf isoenzymes gives a pattern of the genetic constitution of the seed from which that plant was grown. The plant biochemist will be responsible for measuring several biochemical characteristics of the seed and of the plant itself, to better assess the genetic diversity in the germplasm.

The biochemist also has been assigned duties not so directly related to the Genetic Resources Unit, but rather to the needs of the commodity program. This will involve biochemical research on specific problems as well as routine analysis for certain biochemical characters in seeds (protein, oil, starch, free amino acids, etc.). The biochemist is also to analyze new varieties developed by the plant breeders to ensure that characters important for consumer nutrition and acceptance are not lost while selecting for such agronomic characters as high yield or disease resistance. Much work needs to be done to determine the range of nutritional value, and its determinants such as protein availability, in such a basic Latin American food as beans.

### Physiologist

The physiologist will have responsibility to maintain the vegetatively propagated germplasm, primarily cassava,

and to develop or adapt new methodology for storing and distributing these materials. Such methodology relies on cultivating small amounts of meristem tissue that may be used to reconstitute the original plant material. This cultivation has the major advantages of (a) small space requirements (storing small test tubes in contrast to large stakes or else growing in the field), and, (b) the ability to eliminate viruses and other diseases through aseptic transfers. Use of the very low temperatures possible with liquid nitrogen for long-term storage of such tissue cultures will also be investigated by the physiologist.

### International Relationships

Since much of the research done by the unit will find application in other germplasm banks now being set up under the stimulation of the International Board for Plant Genetic Resources (IBPGR), it is essential that close contact be maintained with the Board and with other regional and national centers. This is especially true in the area of genetic analysis based on the grouping of individual accessions on the basis of various characters. Such "cluster analysis," done on a computer, can indicate relationships not readily noticeable to the collector or plant breeder and can even indicate likely areas for obtaining germplasm not present in collections. It is important that cooperative programs be set up to extend this genetic analysis to CIAT's extensive bean collection and, later, to its forage legumes collections.

## SPECIAL PROJECTS

In 1975 the IBPGR provided $50,000 to start work on collecting forage germplasm material. At the end of 1976 about $27,000 remained unspent which IBPGR approved for use instead towards the cost of modifying the existing building into the germplasm facility. In addition, the IBPGR has recently made a $25,000 grant to CIAT towards equipment (including refrigeration equipment) for the germplasm facility.

# Special Studies Unit

## RESOURCES
### CORE

#### Personnel

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Coordinator | | | | | | | | | | | | | |
| *N. N.* | 0.8 | 1.0 | 1.0 | 2.0 | 2.0 | 3.8 | 4.0 | 4.0 | 8.0 | 11.8 | 13.0 | 4.5 | 27.5 |
| Vacancy Factor | | | | | | | 0.2 | 0.2 | 0.4 | | 1.0 | 1.0 | 2.0 |
| | 0.8 | 1.0 | 1.0 | 2.0 | 2.0 | 3.8 | 3.8 | 3.8 | 7.6 | 11.8 | 12.0 | 13.5 | 25.5 |

#### Direct Costs

| | Actual 1976 * | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 2 x 1977 |
|---|---|---|---|---|---|---|---|
| Personnel | | 87,038 | 96,596 | 99,365 | 195,961 | 11 | 13 |
| Supplies | | 8,800 | 5,000 | 5,000 | 10,000 | (43) | (43) |
| Services | | 2,200 | 2,500 | 5,000 | 7,500 | 14 | 70 |
| Travel | | 7,700 | 5,000 | 5,000 | 10,000 | (35) | (35) |
| | | 105,738 | 109,096 | 114,365 | 223,461 | 3 | 6 |
| Capital — Equipment | | | 3,000 | 2,000 | 5,000 | | |

* Included with the Associate Director General - Research

## BUDGET CHANGES

This unit was reviewed by the Board of Trustees' Program Committee in 1977 to determine whether the activities should continue as originally perceived. Since the unit will have specific relevance to small peasant farmers in the tropics and because preliminary results are promising, these activities are considered both complementary and essential to CIAT's basic mandate. The budget of the unit is essentially stabilized from 1977 onwards except for modest increases in the technician category and for recurring expenses.

## PROGRAM COMMENTARY

The Special Studies Unit was established to provide an infrasturcture for visiting scientists and associate experts in agronomy and socio-economics to do studies and research in areas relevant to CIAT's mandate but which are not closely aligned to commodity programs. It will also investigate selected problem areas that are scale neutral or negative in character but are not adequately covered by the commodity programs. The objectives of the agronomic studies are oriented toward small subsistence farms in the tropics and are designed to: (a) increase and stabilize production—especially on secondary lands; (b) reduce energy requirements and back-breaking toil; and, (c) facilitate developing useful new plant species and crop cultivars.

The unit was led until December 1976 by a senior staff weed scientist. Among its staff is a visiting research associate from FAO/The Netherlands who is carrying out investigations on the adoption of improved rice technology on the North Coast of Colombia.

Investigations in the agronomy section of the Special Studies Unit included experiments in three areas.

1. Minimum tillage for maize and beans.

2. Associated cropping of maize, cassava and beans with leguminous "living mulches" and perennial cropping shrubs.

3. Introduction and evaluation of potentially useful new plant and crop cultivars from other international agricultural research centers.

These studies will be reviewed by the Agricultural Production Systems Coordinating Group to formulate guidelines for future activities.

# Hemoparasitology and Acarology

## PROGRAM COMMENTARY

Since 1971 a special project funded by USAID through Texas A & M University has provided senior staff and other support for a program to control hemoparasitic diseases. As from April 1977 it will include, for a period of about 15 months, an acarologist previously funded by the United Kingdom.

The objectives of the hemoparasite-ectoparasite unit focus on the development of programs to control hemoparasitic diseases and their vectors, thus increasing beef production in the tropics. The research activities for 1977-78 will be oriented toward completing the present immunization projects, developing more practical diagnostic methodology, and assessing the role of ticks in hemoparasitic diseases—with special emphasis on ecology and tick control. Finally, training of professionals in these fields will continued.

The approximate staffing and funding in 1977 and 1978, when the project is due to end, will be as in the following table.

| | 1977 | 1978 |
|---|---|---|
| Senior Staff | 2.8 M-Y | 3.0 M-Y |
| Scientific & Supervisory Staff | 2.0 M-Y | 2.0 M-Y |
| Clerical & Other | 19.0 M-Y | 19.0 M-Y |
| Personnel Costs | 204,000 | 204,000 |
| Supplies & Services | 53,000 | 53,000 |
| Travel | 24,000 | 24,000 |
| Construction | 2,000 | 2,000 |
| Vehicle Costs | 15,000 | 15,000 |
| Overhead (paid to Texas A & M) | 62,000 | 62,000 |
| | 360,000 | 360,000 |

# Carimagua Station

## RESOURCES
### CORE

### Personnel

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| | | | | | | - | 2.0 | 2.0 | 4.0 | - | 4.0 | 4.0 | 8.0 |
| Vacancy Factor | | | | | | - | 0.1 | 0.1 | 0.2 | - | 0.2 | 0.2 | 0.4 |
| | | | | | | - | 1.9 | 1.9 | 3.8 | - | 3.8 | 3.8 | 7.6 |

### Direct Costs

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | | | 49,752 | 49,752 | 99,504 | | |
| Supplies | | | 55,000 | 55,000 | 110,000 | | |
| Services | | | 10,000 | 10,000 | 20,000 | | |
| Travel | | | 35,000 | 35,000 | 70,000 | | |
| | - | | 149,752 | 149,752 | 299,504 | | |
| Capital — Equipment | - | 161,000 | | | | | |

## BUDGET CHANGES

This is a new unit established as a result of the recent agreement with ICA whereby CIAT and ICA will jointly manage and finance ICA's station at Carimagua in the Colombian Llanos. Detailed working arrangements are still being discussed with ICA and construction of extensive new facilities is still under way so it is early yet to know the full implications of CIAT's involvement in running the station. Included here are our estimates of the personnel and operating expenses for our share of operating the station. The costs for programs' specific research at the station are included in each program's resources.

## PROGRAM COMMENTARY

On February 28, 1977, the General Manager of ICA and the Director General of CIAT signed a document entitled "Basic Points of Agreement for the Development of ICA-CIAT Cooperative Research in the Llanos." The document established working arrangements between the two institutions for CIAT to carry out research work at the Carimagua Station of ICA. Some of the principles established by the document that are of importance to CIAT include the following.

1. The Director of the station will be recommended by ICA but the Superintendent who will be responsible for the day-to-day operation of the station will be recommended by CIAT.

2. An advisory committee composed of three ICA managers and three CIAT senior staff will be responsible for coordinating and directing operations at the station.

3. A joint fund for the cost of operating the station will be established to which both institutions will contribute.

4. CIAT's operating procedures will be used.

5. The agreement will be for no less than five (5) years, subject to annual review.

With this agreement CIAT expects to have suitable working facilities for research work in the Colombian Llanos so the previous, far more expensive alternative of a separate CIAT station will not be needed.

# Biometrics Unit

## RESOURCES
### CORE

### Personnel

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Biometrics | | | | | | | | | | | | | |
| *D. Franklin** | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 5.0 | 5.0 | 5.0 | 10.0 | 5.0 | 5.7 | 6.0 | 11.7 |
| Vacancy Factor | | | | | | | 0.3 | 0.3 | 0.6 | | 0.3 | 0.3 | 0.6 |
| | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 5.0 | 4.7 | 4.7 | 9.4 | 5.0 | 5.4 | 5.7 | 11.1 |

* Mr. Franklin is presently on a two-year study leave and his functions are being carried out by Dr. G. Mendoza who is on a postdoctoral appointment with CIAT.

### Direct Costs

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 92,404 | 122,728 | 116,955 | 116,150 | 233,105 | ( 5) | 8 |
| Supplies | 1,653 | 2,750 | 3,100 | 3,100 | 6,200 | 13 | 41 |
| Services | 37,837 | 52,800 | 50,000 | 48,500 | 98,500 | ( 5) | 9 |
| Travel | 4,401 | 4,587 | 3,687 | 3,687 | 7,374 | (20) | (18) |
| Equipment Replacement | - | 4,000 | 4,000 | 5,000 | 9,000 | - | 13 |
| | 136,295 | 186,865 | 177,742 | 176,437 | 354,179 | ( 5) | 10 |
| Capital — Equipment | 950 | - | - | - | - | | |

## BUDGET CHANGES

The Biometrics Unit anticipates increases in the demand for its services over the next few years. Amounts budgeted for supplies and services, although reduced somewhat from the 1977 budget level are still substantially above 1976 levels. A new position is requested for 1978 at the clerical level.

The change to new computer hardware is being considered. One of the alternatives is to have equipment capable of providing some local computing facilities for processing both administrative data and part of the scientific data. It is hoped that budgeted personnel in the Biometrics Unit and the Controller's Unit will be sufficient for the new equipment.

## PROGRAM COMMENTARY

The Biometrics Unit is a central services unit responsible for providing research design consultation and data analysis services to all of CIAT's research and training activities. The principal functions of the unit are the following:

1. Research design and analysis of field plot experiments for the crop programs.

2. Research design, data analysis and data base handling for the animal science programs.

3. Information systems and analyses for germplasm collections (Beans, Cassava, and Forages).

4. Consultation on survey design and execution and storage, retrieval and analysis of producer survey data (Cassava, Beans, Beef).

5. Mathematical programming, modelling and computing for economic analyses (all programs except Rice and Maize).

6. Mathematical programming, modelling and computing in the biological sciences (Cassava, Beans, Beef).

7. Training (of Research Interns and Production Specialists).

8. Research to improve methods in the above functions.

The analysis of small experiments, particularly the crop field plot experiments, are done with "desk-top computers" available within the unit. Larger experiments, surveys, data banks and mathematical programming are achieved through the utilization of large scale computers and modern software systems that have been developed in the United States for research in agriculture and economics. Access to large scale computation is achieved through the collaborative program with the National Administrative Department of Statistics (DANE), an agency of the Colombian Government, which has an IBM 370/145 computer.

The Biometrics Unit has the responsibility for maintaining and developing computer-based methodology for the evaluation of technology. As a central service unit, Biometrics will collaborate with the commodity programs to perform analyses required for testing their technology (including regional trials) and through the execution of simulation experiments to screen CIAT- generated technologies for potential viability under farmer conditions.

# Station Operations Unit

## RESOURCES
### CORE

**Personnel**

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Farm Superintendent *A. Díaz* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.5 | 3.0 | 5.5 | 58.5 | 70.9 | 77.2 | 148.1 |
| Vacancy Factor | | | | | | | 0.2 | 0.2 | 0.4 | | 5.6 | 6.1 | 11.7 |
| | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.3 | 2.8 | 5.1 | 58.5 | 65.3 | 71.1 | 136.4 |

**Direct Costs**

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 151,607 | 172,459 | 194,385 | 208,982 | 403,367 | 13 | 24 |
| Supplies | 56,001 | 45,500 | 70,000 | 78,700 | 148,700 | 54 | 47 |
| Services | 4,117 | 2,600 | 4,000 | 4,800 | 8,800 | 54 | 31 |
| Travel | 2,234 | 3,707 | 2,687 | 2,687 | 5,374 | (28) | (10) |
| Equipment Replacement | 21,197 | 20,000 | 25,000 | 30,000 | 55,000 | 25 | 34 |
| | 235,156 | 244,266 | 296,072 | 325,169 | 621,241 | 21 | 30 |
| Capital — Equipment | 41,260 | 57,000 | 30,000 | 50,000 | 80,000 | (47) | (19) |

## BUDGET CHANGES

The major increase in budget will occur with the activation of the Santander sub-station. Although essentially operated and administered from the Palmira headquarters, a small staff will be required for on-site operation and maintenance. We propose the addition of a station supervisor (Research Associate), a secretary, six to eight technical assistants (including tractor operators and a mechanic) and eight laborers. Operational and maintenance expenses are estimated to increase from $14,500 in 1978 to $17,000 by 1981 as experimental activities expand at that site.

Previous experience shows that field activities and demands for station services expand each year at Palmira as programs increase and staff are added. Therefore, comparatively modest increases in labor, supplies and services are projected during 1978 to 1981.

## PROGRAM COMMENTARY

The total area of CIAT's main station is utilized as follows: 182 hectares of leveled and 14 hectares of unleveled land are cultivated by the research programs; 143 hectares of leveled and 70 hectares of unleveled land are in demonstrations and production crops; 11.4 hectares are in pastures; 13.5 hectares are used as reservoirs; and roads, ditches, buildings and recreational and other grounds occupy the remaining area to make up the total of 522 hectares.

Station Operations maintains 36 kilometers of all-weather roads—2.7 kilometers of which have been covered with asphalt—43 kilometers of drains, and 26.6 kilometers of irrigation canals.

Station Operations supports all of CIAT's programs, operates a tractor pool, which will be increased by three new tractors in 1977, manages a permanent labor pool and supplies temporary hand labor. Land areas that are not utilized by the programs are maintained weed-free or planted to produce commercial crops which are sold for about $170,000 per annum and generate net income of about $40,000.

The new Santander research site is expected to add about 200 hectares to CIAT's farm management responsibilities. It will also require some development in terms of buildings, fences, roads, drainage, and energy and water supply.

# Service Laboratories

## RESOURCES
### CORE

**Personnel**

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| | | | | | | 1.0 | 1.0 | 1.0 | 2.0 | 14.5 | 15.5 | 16.7 | 32.2 |
| Vacancy Factor | | | | | | - | 0.1 | 0.1 | 0.2 | - | 1.2 | 1.3 | 2.5 |
| | | | | | | 1.0 | 0.9 | 0.9 | 1.8 | 14.5 | 14.3 | 15.4 | 29.7 |

**Direct Costs**

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 49,066 | 63,629 | 62,232 | 65,037 | 127,269 | ( 2) | 13 |
| Supplies | 14,681 | 22,000 | 20,000 | 23,350 | 43,350 | ( 9) | 18 |
| Services | 303 | 1,430 | 1,600 | 1,800 | 3,400 | 12 | 96 |
| Travel | 58 | 1,100 | 1,100 | 1,100 | 2,200 | - | 90 |
| Equipment Replacement | 491 | 10,000 | 10,000 | 15,000 | 25,000 | - | 138 |
| | 64,599 | 98,159 | 94,932 | 106,287 | 201,219 | ( 3) | 23 |
| Capital — Equipment | - | 20,000 | 23,000 | 22,000 | 45,000 | 15 | 13 |

## BUDGET CHANGES

A progressive addition of three support staff, one per year, from 1978 until 1980 is proposed. These three additional support staff are proposed for Analytical Services (2) and the Wash Room (1) because of the greater demand of work expected from these two sub-sections.

## PROGRAM COMMENTARY

CIAT's Service Laboratories are directly supervised by two members of the four-man laboratory committee.

The basic fuctions of the Service Laboratories as a support unit are the following:

1. To provide CIAT's programs with rapid and efficient routine analyses of soils, plant and animal tissues, feedstuffs, fertilizers, water, etc.
2. To provide space and equipment for research projects and students to perform non-routine analyses and upon request to provide technical assistance to help programs with specific analytical problems.
3. To provide shared facilities and services for the washing and sterilizing of glassware for several research programs.
4. To provide maintenance and repair services for all laboratory instruments and equipment in CIAT.
5. To provide small animals for research purposes to several CIAT programs.

# Greenhouse Services

## RESOURCES
### CORE

**Personnel**

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| | | | | | | | | | | - | 3.0 | 4.0 | 7.0 |
| Vacancy Factor | | | | | | | | | | | 0.2 | 0.3 | 0.5 |
| | | | | | | | | | | - | 2.8 | 3.7 | 6.5 |

**Direct Costs**

| | Actual 1976 | Budget 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 / Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | | | 6,308 | 8,420 | 14,728 | | |
| Supplies | | | 4,000 | 5,000 | 9,000 | | |
| | | | 10,308 | 13,420 | 23,728 | | |
| Capital — Equipment | | | 20,000 | | | | |

## PROGRAM COMMENTARY

The Greenhouse Services Unit has been created to ensure the efficient operation of all greenhouse and screenhouse facilities at CIAT for the use by all research programs requiring space. The unit will be controlled by the Greenhouse Committee which is appointed annually by the Director General. The projected staff will be responsible to the Greenhouse Committee for the daily operations of the unit.

The functions of the unit will be as follows:

1. Supervision and daily maintenance of all capital equipment including: greenhouses, screenhouses, water de-ionizers, soil mixing equipment, and soil sterilization, soil storage and air cooling equipment.
2. Storage of supplies of soil and other potting materials as requested by the programs; the sterilization of soil and the general preparation of potting materials; and the maintenance of adequate supplies of treated water at all times.
3. Cleaning of the greenhouse area including the surrounding patios and all glass surfaces at regular intervals, and the cleaning and maintenance of the cooling pads in the greenhouse.
4. Provision of assistance to individual programs during heavy work load periods depending on labor availability.
5. Provision of a central store for all shared equipment and supplies to ensure the proper functioning of the equipment and to avoid duplication fo these facilities by various users.

# Associate Director General - Research

## RESOURCES
### CORE

**Personnel**

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Assoc. Dir. General (Research) *K. Rachie* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 0.7 | 1.0 | 1.0 | 2.0 | 1.0 | 1.0 | 1.0 | 2.0 |
| Vacancy Factor | | | | | | | 0.1 | 0.1 | 0.2 | | 0.1 | 0.1 | 0.2 |
| | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 0.7 | 0.9 | 0.9 | 1.8 | 1.0 | 0.9 | 0.9 | 1.8 |

**Direct Costs**

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 2 x 1977 |
|---|---|---|---|---|---|---|---|
| Personnel | 141,487 | 167,041 | 178,553 | 177,737 | 356,290 | 7 | 15 |
| Supplies | 2,344 | 1,600 | 550 | 550 | 1,100 | (66) | (72) |
| Services | 554 | 2,200 | 750 | 750 | 1,500 | (66) | (46) |
| Travel | 15,570 | 17,715 | 9,715 | 9,715 | 19,430 | (45) | (42) |
| Equipment Replacement | 6,462 | | | | | | |
| | 166,417 | 188,556 | 189,568 | 188,752 | 378,320 | 1 | 6 |

## BUDGET CHANGES

The budget for the Associate Director General—Research, which includes stipends for Visiting Scientists and Consultation, proposes only modest increases for 1978 and 1979 over the 1977 budget. It is expected that Visiting Scientists can be utilized very effectively to undertake specific problem-solving research on a short-term basis. This capability will permit considerable flexibility in dealing with the inevitable unanticipated constraints in agricultural research in the lowland tropics. A total of $75,000 is provided in 1978 and 1979 for about 3 man-years. This compares with $66,000 in 1977.

## PROGRAM COMMENTARY

The office of the Associate Director General—Research has two separate budgetary categories—Administration and Visiting Scientists. The Special Studies Unit has been given a separate status as one of the "Associated Research Units" and within the budgetary limitations of previous projections. From 1978 onwards budgetary requirements are stable.

Nine functions were ascribed to the office of the Associate Director General—Research in the 1977 Program and Budget Proposal; these can be summarized as "overall responsibility for all research activities at CIAT." During the past year considerable time was spent in restructuring the Beef Program and developing other programs such as the Genetic Resources Unit and the Special Studies Unit. Recruitment of international scientific staff for both core programs and special projects has been especially time-consuming since 13 positions were vacant in 1976; and 18 positions (including replacements) are available in 1977. Nevertheless, by mid-April 1977, 17 exceptionally well-qualified scientists had been appointed or have accepted contracts to join CIAT by mid-1977, and five additional candidates were selected for interview to fill 1977 vacancies.

# Associate Director General -International Cooperation

## RESOURCES
### CORE

#### Personnel

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Assoc. Dir. General (International Coop.) *A. Grobman* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | - | - | - | - | 1.8 | 2.0 | 2.0 | 4.0 |
| Vacancy Factor | - | - | - | - | - | | | | | - | 0.1 | 0.1 | 0.2 |
| | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | - | - | - | - | 1.8 | 1.9 | 1.9 | 3.8 |

#### Direct Costs

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/78 Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 44,344 | 100,114 | 86,481 | 85,430 | 171,911 | (14) | 19 |
| Supplies | - | 550 | 900 | 900 | 1,800 | 64 | 64 |
| Services | 291 | 550 | 550 | 550 | 1,100 | - | 31 |
| Travel | 1,283 | 32,450 | 25,550 | 25,550 | 51,100 | (21) | 51 |
| | 45,918 | 133,664 | 113,481 | 112,430 | 225,911 | (15) | 26 |

## BUDGET CHANGES

In 1977 substantial amounts were included in the office of the Associate Director General—International Cooperation for the support of outreach contract staff before and between assignment and for travel, both by CIAT scientists and other persons, in connection with International Cooperation activities. Although we really have no experience on which to judge needs in these two areas, we think amounts budgeted may have been a bit excessive, thus we have reduced them.

## PROGRAM COMMENTARY

### Objectives

The objectives of CIAT's International Cooperation activities can be defined as follows:

1. To test and transfer rapidly and effectively new technology developed at CIAT as well as existing knowledge on those commodities of concern to CIAT, to national research and development agencies, both public and private.

2. To contribute, through networking research and training activities, to the strengthening of national research and development institutions in order to reinforce their capacity to accelerate the validation, adaptation, diffusion to farmers, and adoption by them, of new and existing technologies for increasing productivity and production on those commodities of concern to CIAT, aiming at the improvement of human nutrition

### Activities

Four components of International Cooperation are identified which provide useful and effective means of accomplishing the above objectives.

1. Research Networks

2. Technical assistance and feedback

3. Training and conferences

4. Information services

### Research Networks

The need to test varieties, treatments and systems of technologies in the context of variable environments and years, in the countries served, and in the context on the commodities dealt with at CIAT, requires the establishment of a network of outlying tests in several countries. International Cooperation interfaces with research and has the following three systems of networks.

Network I—Outlying replicated tests, under direct CIAT control
Network II—National validation networks indirectly assisted by CIAT.
Network III—International or regional testing networks.

### Technical Assistance and Feedback

Recognizing the need for information from and about the countries, International Cooperation personnel also have the responsibility for providing such information to CIAT headquarters in order to better document decisions about other in-country activities, for example, collaborative research projects, validation research, training needs, between-country cooperation schemes, etc. In addition, together with headquarters personnel, they will occasionally perform technical assistance functions, especially as related to the possible establishment of bilateral contracts and regional collaborative efforts.

### Training and Conferences

(These activities are described under the specific budget section on page 54 .)

### Information Services

(These activities are described under the specific budget section on page 58 .)

## SPECIAL PROJECTS

Since March 1973, the Rockefeller Foundation has funded a special project through CIAT to assist and

strengthen ICTA, the national agricultural research institution in Guatemala. The period for the grant will expire on January 31, 1978 with a possible extension to December 31, 1978. Approximate inputs would be as follows.

| | 1977 | 1978 | CIAT Core Staff Input per annum |
|---|---|---|---|
| Associate Director — ICTA* | 1.0 M-Y | 1.0 M-Y | 0.1 M-Y |
| Coordinator of Expt. Stations — ICTA* | 1.0 M-Y | 1.0 M-Y | |
| Personnel Costs | $93,000 | $98,000 | |
| Supplies & Services | 13,000 | 6,000 | |
| Travel | 14,000 | 10,000 | |
| Overhead | 5,000 | 3,000 | |
| | $125,000 | $117,000 | |

* Rockefeller Foundation provides these staff on a no-cost basis to the project. Personnel Costs include estimates of the costs of these two individuals.

In addition to the above project, the following special projects for outreach and training activities are listed in the sections for the respective commodities.

Beans: One UNDP-funded International Cooperation Expert.

Beef: One UNDP-funded International Cooperation Expert.

Rice: Two UNDP-funded International Cooperation Experts.

Cassava: Two IDRC-funded Outreach Production Specialists, one for Asia and one for Latin America.

# Training and Conferences

## RESOURCES
## CORE

### Personnel

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Leader, Training and Conferences *F. Fernández* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 3.0 | 3.0 | 6.0 | 2.0 | 1.0 | 1.0 | 2.0 |
| Instructional Techniques and Communication *F. Kramer* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.7 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 1.0 | 2.0 |
| Training Activities | - | - | - | - | - | 5.2 | 7.5 | 8.0 | 15.5 | 1.8 | 4.0 | 4.0 | 8.0 |
| Conference Coordination | - | - | - | - | - | 1.0 | 1.0 | 1.0 | 2.0 | 3.0 | 3.0 | 3.0 | 6.0 |
| | 2.0 | 2.0 | 2.0 | 4.0 | 4.0 | 9.9 | 12.5 | 13.0 | 25.5 | 8.8 | 9.0 | 9.0 | 18.0 |
| Vacancy Factor | - | - | - | - | - | - | 0.7 | 0.8 | 1.5 | - | 0.4 | 0.4 | 0.8 |
| | 2.0 | 2.0 | 2.0 | 4.0 | 4.0 | 9.9 | 11.8 | 12.2 | 24.0 | 8.8 | 8.6 | 8.6 | 17.2 |

## Direct Costs

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increased 1978/1977 | % Increased Total 1978/79 / Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 462,766 | 525,458 | 633,733 | 705,712 | 1,339,445 | 21 | 36 |
| Supplies | 6,569 | 9,130 | 10,000 | 11,000 | 21,000 | 10 | 34 |
| Services | 22,264 | 32,120 | 27,100 | 25,900 | 53,000 | (16) | ( 3) |
| Travel | 96,377 | 225,995 | 176,500 | 188,000 | 364,500 | (22) | 13 |
| | 587,976 | 792,703 | 847,333 | 930,612 | 1,777,945 | 7 | 29 |
| Capital — Equipment | 17,346 | - | 16,000 | 4,000 | 20,000 | - | (42) |

## BUDGET CHANGES

Reflecting overall philosophy and changes in the Training and Conferences Program, the former sub-programs of Training Coordination in Plant Sciences and Training Coordination in Animal Sciences have been discontinued. Senior staff are reduced to two with the transfer to the Beef Program of the former Training Coordinator for Animal Sciences. The position of Leader of the Program will become effective in 1978 (instead of 1980 as planned earlier). The former Training Coordinator for Plant Sciences has served as program leader since 1976.

One training associate (in forages) will be added to the Training Activities section to make a total of seven training associates. One clerical position is being changed to the scientific and supervisory level (as an administrative assistant) to provide processing services to trainees.

Reduced figures for services and travel reflect a substantial reduction in conference support from levels budgeted in earlier years. This reduction is based on experiences from previous years when we have received extra funds for some conferences while other funds did not materialize.

Numbers of trainees are projected to increase over the next five years. The table below, projecting the number of trainees to be funded from core budget and other sources, indicates that increases are to be found mostly at the higher academic levels.

| | 1977 | | 1978 | | 1979 | | 1980 | | 1981 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Core | Others | Core | Others | Core | Others | Core | Others | Core | Others |
| Postdoctoral fellows | 4 | - | 8 | - | 10 | - | 15 | - | 15 | - |
| Visiting research associates | 13 | 2 | 15 | 10 | 20 | 10 | 25 | 10 | 30 | 10 |
| Postgraduate interns, research | 25 | 15 | 25 | 5 | 20 | 5 | 20 | 5 | 20 | 5 |
| Postgraduate interns, production | 5 | 40 | 10 | 70 | 10 | 70 | 10 | 70 | 10 | 70 |
| | 47 | 57 | 58 | 85 | 60 | 85 | 70 | 85 | 75 | 85 |

## PROGRAM COMMENTARY

The primary objective of the Training and Conferences efforts at CIAT, as revised and presented in the 1977 Program and Budget document, continue to focus on the development of international networks of separate national commodity research teams, for the validation, adaptation and diffusion of CIAT-generated technology.

Activities in the program are being consolidated along four courses of action previously developed. These include:

1. Training in research disciplines with increased emphasis on the higher academic levels and higher leadership ranks.

2. Integrated, multidisciplinary training on production of individual commodities, through medium-term internships and intensive short courses.

3. Support of within-country training efforts integrated with commodity outreach efforts.

4. Bringing together, in conferences and workshops, scientists and decision-makers, to inform then and to mutually derive strategies, obtain commitments and provide followup in support of the international commodity networks.

While in each of the four instances the primary clients are national institutions, private and semi-official organizations that direct major efforts to farmers are also receiving CIAT's attention. Regardless of the links chosen in the technology transfer chain, the ultimate recipient and subject of application of new technologies is the producer, with the consumer being considered as the beneficiary.

### Training

Training efforts at CIAT have changed considerably, and are continuing to evolve, toward increasing emphasis on the individual commodities and to a decentralized structure that puts most of the training activities into each commodity program. In addition to the senior staff changes mentioned in the Budget Changes section, a Training Activities section has been formed. This section provides overall direction for training operations in the commodity programs. These operations are provided under a unified philosophy and methodology for all commodity programs and units. Under the new budget, the section will contain seven training associates—one each in beans, cassava, beef, forages, rice and swine as well as one for management/economics. This latter associate provides input to training programs in the five commodities and assists with training in the management of experiment stations.

During 1976, 188 professionals from 30 countries were added to the 602 trained through the previous year Forty persons were trained in beans, 55 in cassava, 38 in beef, 12 in rice, 22 in swine and 21 in other areas. Sizes of international networks in the various commodities are therefore increasing, but attrition, changes in positions in the institutions, study leaves and insufficient capacity for backup are partially offsetting the buildup of the necessary networks, thus dictating expanded efforts in training.

While expansion is needed, CIAT training efforts are rapidly moving from a broad, relatively nonselective position to a more selective, aggressive and planned action. Although the services of the Center and the technology generated are offered to all interested countries in the tropics, certain nations are being selected for priority attentions. Some criteria for this selection are the importance of the commodity in the country, status of research in the country and interest and willingness of the national institutions to commit resources to increase production and productivity. In this context, training and conferences are coupled with the outreach plans of each commodity program in an integrated strategy of international cooperation.

Another important component of training activities is the production of instructional materials. These materials, which deal with all of the CIAT commodities, help to improve the quality of training, facilitate tasks of the senior staff in training and provide an important means for transferring technology and multiplying training within the target countries.

## Conferences

In 1976, CIAT sponsored or co-sponsored 12 events and 14 are scheduled for 1977. Noteworthy among these conferences was a meeting to help consolidate the existing loose network of rice research workers. Fifty scientists from 14 countries met in August at a workshop on International Rice Trials. Strategy plans from that workshop are now being implemented to achieve a better coordinated effort in international testing to select rice lines for increased production.

# SPECIAL PROJECTS

Funds have been requested from UNDP for an integrated training and international cooperation project which includes the following resources and projections for training:

Training materials production—3 producers/coordinators; 1 editor; 1 graphic artist; 1 photographer; 2 secretaries; 1 technician; and equipment, supplies and services for these personnel.

Training courses—2 training assistants; 2 beef courses (6 months each); 1 swine course (5 months); 4 crops courses (5 months each); 4 crops courses (1 month each); 2 cassava courses (12 months each); and 1 swine course (6 weeks).

Master's or PhD scholarships—16 man-years.

We have been assured that the project will be approved in the near future. The manpower and other resources requested are as follows:

| | 1977 | 1978 | 1979 | CIAT Core Staff Input per annum |
|---|---|---|---|---|
| Senior Staff | - | - | - | 2.3 M-Y |
| Scientific & Super. Staff | 2.6 M-Y | 7.5 M-Y | 6.5 M-Y | |
| Clerical | 1.5 M-Y | 2.0 M-Y | 2.0 M-Y | |
| Total Costs | $71,000 | $469,000 | $479,000 | |

# Library and Information Services

## RESOURCES
### CORE

Personnel

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Librarian *F. Monge* (Leader) | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 8.8 | 9.0 | 9.0 | 18.0 | 14.8 | 16.5 | 17.7 | 34.2 |
| Coord. Public Inf. *N. N.* | | 0.5 | 1.0 | 1.5 | 2.0 | 3.0 | 3.0 | 3.5 | 6.5 | 1.0 | 1.7 | 2.0 | 3.7 |
| Editor *M. Gutierrez* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 3.0 | 3.0 | 3.0 | 6.0 | 13.0 | 13.0 | 13.0 | 26.0 |
| Editor *C. Bower* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 3.0 | 3.0 | 3.0 | 6.0 | 12.8 | 13.0 | 13.0 | 26.0 |
| | 3.0 | 3.5 | 4.0 | 7.5 | 8.0 | 17.8 | 18.0 | 18.5 | 36.5 | 41.6 | 44.2 | 45.7 | 89.9 |
| Vacancy factor | | | | | | | 1.1 | 1.1 | 2.2 | | 3.2 | 3.3 | 6.5 |
| | 3.0 | 3.5 | 4.0 | 7.5 | 8.0 | 17.8 | 16.9 | 17.4 | 34.3 | 41.6 | 41.0 | 42.4 | 83.4 |

## DIRECT COSTS

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 / Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 363,770 | 422,846 | 432,678 | 457,599 | 890,277 | 2 | 13 |
| Supplies | 59,685 | 105,820 | 100,000 | 100,000 | 200,000 | ( 5) | 21 |
| Services | 66,107 | 89,710 | 90,000 | 100,500 | 190,500 | - | 22 |
| Travel | 6,440 | 8,504 | 8,374 | 9,574 | 17,948 | ( 2) | 20 |
| Equipment Replacement | 18,795 | | 10,000 | 15,000 | 25,000 | | (33) |
| | 514,797 | 626,880 | 641,052 | 682,673 | 1,323,725 | 2 | 16 |
| Capital — Equipment; Books, etc. | 48,051 | 68,000 | 75,000 | 27,000 | 102,000 | 10 | (12) |

# BUDGET CHANGES

## Information Services

The needs to intensify the design and production of messages to CIAT's audiences and to provide for an increased demand for information and attention to visitors have been identified. Steps towards meeting this objective are being taken through the establishment of a new senior staff position in public information in 1978. Messages to be produced will be semi-technical publications on CIAT research results tailored to cover a wide spectrum of the interested public, and press releases, other general publications, films and video-tape productions for distribution to individual institutions and through mass media approaches, such as TV networks, respectively. Films will also aid in improving in-house presentations of CIAT's activities to visitors as well as provide scientists and outreach specialists with a powerful tool to project the image and activities of CIAT into collaborating countries. Five 15-20 minute, 16-mm films will be produced in 1978/79.

In addition, a secretarial position is added in 1978 and one associate information officer (Mass Media) is planned for 1979.

Basic video-tape production equipment is budgeted as capital under Library and Information Services. The viewing component of this equipment, however, is budgeted under the Training and Conferences Program since video-tapes will also be very important training aids.

## Library and Documentation

The capital budget for books is decreased in 1978/79 since the purchase of back volumes of journals is considered to be completed. The increased importance of CIAT's documentation activities (as indicated by user countries), however, makes it necessary to complement in-house documentation by linking with international networks (such as TYMNET) via Telex and possibly other means of high-speed communications.

Communication and exchanges of information between international center scientists and others in related fields (as recommended by the CGIAR Review Committee) will also be emphasized through networking.

Two junior level positions (a technician and an expert) are added in 1978.

# PROGRAM COMMENTARY

## Objectives

In addition to providing basic support for research and training activities at CIAT, the Library and Information Services Unit contributes to the transfer of technology developed (Information Services) or processed (Library)

by CIAT to appropriate audiences in about 50 countries. It is also responsible for the institution's public image.

## Activities

*Library and Documentation.* The basic library collection has approximately 37,500 books and receives 1,300 journals regularly.

In 1976 the main highlight in documentation was the completion of the backlog of information existing on cassava. An expanded Phase II for the Cassava Information Center will integrate documentation more closely with other communication activities such as the publication of monographs, a semi-annual Cassava Newsletter and the continuation of the successful series of manuals. The regular distribution of abstract cards (current awareness service) and specific topic searches for subscribers in the areas of cassava, beans and agricultural economics continued. The Documentation Center had about 1,500 regular subscribers in 1976. Volume II on cassava (837 abstracts), Volume I on field beans (1,220 abstracts) and Volume I on Latin American agricultural economics (743 abstracts) were published simultaneously. Semi-annual supplements to these will be issued as well as Spanish versions of the volumes of cassava and bean abstracts. A documentation series on tropical grass and legume forages will be started in 1977.

Other services include the Tables of Contents (in Animal Science, Plant Science and Agricultural Economics and Development) and short, specific bibliographies done on request (62 in 1976). A new bibliographic series was started in which selected book reviews published in technical journals are reproduced as a current awareness tool for scientists and as an aid for libraries in making acquisitions.

A collaborative agreement was reached with the Instituto Interamericano de Ciencias Agrícolas (IICA) in Costa Rica, whereby their country representatives can transmit requests for CIAT services from users in these countries and receive payment in local currency. Similar arrangements were made with other national institutions for the distribution and processing of services such as the Tables of Contents within each country. Thus, national institutions can meet a significant portion of the photocopying requests with the CIAT Library as a backstopping service for materials unavailable locally.

*Public Information Office.* A total of 3,299 visitors including farmers, students, scientists and policymakers, civic groups, etc. were attended in 1976. This office also handled relations with national and international news media; TV and other broadcasting corporations recorded technical information at CIAT for dissemination in several countries. CIAT also participated in two national agricultural fairs.

*Information Services.* Over 30 publications were printed and distributed during 1976. CIAT scientists are encouraged to publish their results in established scientific journals; reprints are then made at CIAT for wider distribution. Because of the language problem, translations will be made of selected articles in 1977. A monthly internal newspaper was begun in 1976, representing an efficient means of communication among the institution's various employees.

## SPECIAL PROJECT

Projects to provide documentation services in Beans and Economics previously funded by the IDB and the Ford Foundation, respectively, have ended and this work will be handled in the future out of the core budget. A second phase of the Cassava Information Center funded by IDRC was approved in August 1976. This project provides the following over a 2 1/2 year period.

| | | CIAT Core Staff Input per annum |
|---|---|---|
| Editor | 2.5 M-Y | 0.3 M-Y |
| Secretary | 2.5 M-Y | |
| Personnel Costs | $ 74,000 | |
| Publications* | 88,000 | |
| Travel (including two meetings of advisory committee) | 9,000 | |
| Training | 4,000 | |
| Overhead | 26,250 | |
| Contingency | 17,500 | |
| | $218,750 | |

* Includes bibliography, newsletter, reproduction of articles, monographs, manuals, abstracts cards, etc.

# Maize Unit

## RESOURCES
### CORE

**Personnel**

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Maize Science *G. Granados* (Coord.) | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | | | | | | | | |
| | | | | | | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 4.0 | 4.0 |
| Maize Science *J. Barnett* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | | | | | | | | |
| | 2.0 | 2.0 | 2.0 | 4.0 | 4.0 | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 |

Funds for the Maize Relay Unit are provided through a grant to CIMMYT by CIDA. The amount of $286,000 is available for 1977 of which $186,000 is for expenses incurred through CIAT. Funding for future years depends on the grants available from CIDA or other donors.

## PROGRAM COMMENTARY

The CIMMYT-CIAT Regional Andean Maize Unit began operations in May 1976 with an operating budget provided by CIDA through CIMMYT. In May 1976 one senior staff member was posted to CIAT, at Cali and in January 1977 the second member of the team arrived at CIAT. No further increase in staff is projected for the near future.

The relay team will provide a link between CIMMYT-CIAT and the national maize programs of the Andean Region (Bolivia, Colombia, Ecuador, Peru and Venezuela).

Research at CIAT headquarters will be substantially reduced in order to free the team for extensive travel in the region. Research emphasis will be on activities for which the conditions of the CIAT station are especially favorable. One example is in the performance of the plant materials developed by CIMMYT which, when planted in the Cauca Valley, behave differently, growing from 50 to 100 centimeters taller than in their place of origin. Selections made at CIAT within materials developed by CIMMYT should help to develop materials with a more stable plant height across various environments. The CIAT

station also provides a good location for selecting materials tolerant to poor drainage conditions. Good progress has been made in this respect.

The primary emphasis of the CIMMYT-CIAT maize team will be in outreach. In 1976 the staff traveled 33 percent of the time; in 1977 this time is expected to double.

The maize team will devote full time to services which will strengthen national maize programs of the Andean Region. These services include:

1. Monitoring CIMMYT trials throughout the Andean Region.
2. Promoting regional testing.
3. Promoting the exchange of genetic materials between the national programs and between them and CIMMYT and CIAT.
4. Assisting in the organization of an annual or biannual maize workshop.
5. Promoting training courses for production agronomists, with emphasis on training within national programs.
6. Producing an annual report on maize improvement in the region to serve the needs of the Andean countries.
7. Promoting the establishment of maize production programs with the objective of increasing yields per unit area.
8. Identifying candidates for training both at CIMMYT and CIAT.

# Administration

## RESOURCES
### CORE

#### Personnel

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Director Genral *J. L. Nickel* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 2.0 | 2.0 | 4.0 |
| Executive Officer *J. A. Cuéllar* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 9.5 | 10.0 | 10.0 | 20.0 | 41.8 | 43.0 | 43.0 | 86.0 |
| Controller *A. V. Urquhart* | 1.0 | 1.0 | 1.0 | 2.0 | 2.0 | 7.0 | 8.0 | 9.0 | 17.0 | 19.8 | 22.3 | 23.0 | 45.3 |
| | 3.0 | 3.0 | 3.0 | 6.0 | 6.0 | 17.5 | 19.0 | 20.0 | 39.0 | 63.6 | 67.3 | 68.0 | 135.3 |
| Vacancy Factor | | | | | | | 1.1 | 1.2 | 2.3 | | 3.5 | 3.5 | 7.0 |
| | 3.0 | 3.0 | 3.0 | 6.0 | 6.0 | 17.5 | 17.9 | 18.8 | 36.7 | 63.6 | 63.8 | 64.5 | 128.3 |

## Direct Costs

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total 1978/79 Total 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 527,555 | 616,552 | 617,227 | 622,427 | 1,239,654 | | 8 |
| Supplies | 27,501 | 24,365 | 25,658 | 25,758 | 51,416 | 5 | (1) |
| Services | 74,573 | 106,480 | 91,560 | 95,640 | 187,200 | (14) | 3 |
| Travel | 38,719 | 49,513 | 48,307 | 48,307 | 96,614 | ( 2) | 9 |
| Equipment Replacement | 1,669 | - | - | - | - | - | - |
| | 670,017 | 796,910 | 782,752 | 792,132 | 1,574,884 | ( 2) | 7 |
| Capital — Equipment | 15,405 | 145,400 | 184,000 | 45,000 | 229,000 | 27 | 42 |

## BUDGET CHANGES

Services are reduced in 1978 because 1977 includes $20,000 for the acquisition of computer software for the Controller. This reduction is offset partially by increases for computer rentals. Four positions are added to the Controller to enable computer services, previously contracted out, to be handled in-house. A position is also added to handle the financial and other reporting requirements for the ever-increasing number of special projects.

## PROGRAM COMMENTARY

Grouped under Administration are the offices of the Director General, The Executive Officer and the Controller. These offices, together with the two Associate Directors General, are responsible for overall management of the Center. The Executive Officer is responsible for purchasing, travel, food and housing, warehouse, security, local staff personnel matters, insurance, the physical plant and the motor pool. The costs of these last two are shown under General Operating Expenses. The Controller is responsible for budget preparation and management, accounting, payroll, internal auditing, financial reports and certain senior staff personnel matters.

# General Operating Expenses

## RESOURCES
### CORE

**Personnel**

| | Man-years Senior Staff | | | | | Man-years Scient. & Super. | | | | Man-years Clerical & Other | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | '77 | '78 | '79 | Total '78-79 | Total '80-81 | '77 | '78 | '79 | Total '78-79 | '77 | '78 | '79 | Total '78-79 |
| Phys. Plant-Maintenance | | | | | | 3.0 | 3.0 | 3.0 | 6.0 | 43.1 | 44.0 | 44.0 | 88.0 |
| Phys. Plant. Security | | | | | | - | - | - | - | 35.3 | 36.0 | 36.0 | 72.0 |
| Phys. Plant-Cleaning | | | | | | - | - | - | - | 55.3 | 57.0 | 57.0 | 114.0 |
| Phys. Plant-Gardens | | | | | | - | - | - | - | 11.0 | 11.0 | 11.0 | 22.0 |
| Motor and Tractor Pool | | | | | | 1.0 | 1.0 | 1.0 | 2.0 | 42.8 | 46.5 | 47.0 | 93.5 |
| | | | | | | 4.0 | 4.0 | 4.0 | 8.0 | 187.5 | 194.5 | 195.0 | 389.5 |
| Vacancy Factor | | | | | | | 0.2 | 0.2 | 0.4 | | 15.6 | 15.6 | 31.2 |
| | | | | | | 4.0 | 3.8 | 3.8 | 7.6 | 187.5 | 178.9 | 179.4 | 358.3 |

## Direct Costs*

| | Actual 1976 | Revised 1977 | Proposed 1978 | Proposed 1979 | Proposed Total | % Increase 1978/1977 | % Increase Total, 1978/79 / Total, 1976/77 |
|---|---|---|---|---|---|---|---|
| Personnel | 371,399 | 522,425 | 502,613 | 503,562 | 1,006,175 | ( 4) | 13 |
| Supplies | 231,338 | 303,820 | 331,240 | 331,240 | 662,480 | 9 | 24 |
| Services | 248,963 | 310,920 | 322,690 | 328,290 | 650,980 | 4 | 16 |
| Travel | 4,251 | 12,050 | 10,050 | 10,050 | 20,100 | (17) | 23 |
| Other Expenses | 83,155 | 78,100 | 72,000 | 72,000 | 144,000 | ( 8) | (11) |
| Equipment Replacement | 59,909 | 50,000 | 60,000 | 65,000 | 125,000 | 20 | 14 |
| | 999,015 | 1,277,315 | 1,298,593 | 1,310,142 | 2,608,735 | 2 | 15 |
| Capital — Equipment | 16,058 | 24,000 | 37,000 | 20,000 | 57,000 | 54 | 42 |

* Includes General Expenses; see details at end of Program Commentary

## BUDGET CHANGES

Two technicians are requested for a precision workshop to help programs fabricate small experimental items. Electricity is increased in proportion to the projected increase in installed capacity. Other minor adjustments have been made in general expenses.

## PROGRAM COMMENTARY

The Palmira installations consist of nine buildings, including two laboratory buildings, plus 76 living units, and recreational facilities on 45,000 square meters of maintained grounds. The gross area of buildings is 24,000 square meters, of which 65 percent is air-conditioned.

Other than electricity, for which only an emergency generator is maintained, CIAT provides all its own services. The Physical Plant includes resources to run these services, maintain all buildings and grounds in a serviceable and clean manner and provide a security force of 36 people.

CIAT operates a fleet of about 150 vehicles which includes buses, trucks, vans, pickups, jeeps, station wagons, passenger cars and motorcycles, from various manufacturers. The Motor and Tractor Pool is responsible for: servicing and maintaining these vehicles and the farm machinery; providing regular bus services to Cali and Palmira for trainees, visitors and certain employees who work outside normal hours; maintaining a contracted bus service for the transportation of employees to and from Cali and Palmira; and, providing vehicles and drivers for special services when needed.

Included also in this grouping are general expenses which total $419,000 for 1978 and $424,000 for 1979. These are not conveniently assignable to individual programs and are, therefore, included in total in this group. The following tabulation gives details of these expenses.

| | Actual 1976 | Budget 1977 | Budget 1978 | Budget 1979 |
|---|---|---|---|---|
| Office Supplies | 42,000 | 52,000 | 55,000 | 55,000 |
| Electricity | 84,000 | 106,000 | 110,000 | 115,000 |
| Boiler fuel, chemicals, etc. | 13,000 | 20,000 | 22,000 | 22,000 |
| Telephone | 61,000 | 64,000 | 60,000 | 60,000 |
| Telex and cables | 22,000 | 25,000 | 25,000 | 25,000 |
| Postage | 62,000 | 67,000 | 70,000 | 70,000 |
| Weekend duty officer | 4,000 | 5,000 | 5,000 | 5,000 |
| Insurance | 58,000 | 60,000 | 60,000 | 60,000 |
| Bank charges and exchange differences | 10,000 | 11,000 | 12,000 | 12,000 |
| | 356,000 | 410,000 | 419,000 | 424,000 |

# Capital Requirements

## EQUIPMENT

As part of the budget preparation process, each program and unit was asked to include in its budget request detailed lists of equipment needs. Scientists have always found it difficult to predict the equipment they will need since it depends so much on results of their research and the future directions this will take. Equipment is designed to do a particular job and cannot be changed to do a different job. The task of predicting needs was even more difficult this year because of the need to budget for two years. For these reasons, the list of equipment contains fairly substantial amounts for unspecified and miscellaneous equipment.

The equipment requested was reviewed first by each program leader, then by the Associate Director General responsible for the program and finally by the Director General together with the respective Associate Director General.

In addition to the review of budget requests, at the time an item is to be ordered it is further reviewed by the appropriate Associate Director General, and in certain cases by the Capital Committee.

In the 1977 Program and Budget document we included projections of equipment needs for 1978 and 1979. In preparing this proposal, we have tried to keep within these projections but two factors have caused this not to be possible: (a) the increase in the number of senior staff beyond that projected; and (b) a decision to recognize as a budgeting norm that two work vehicles are required for each research scientist whereas previously we have rather unrealistically budgeted and projected only one vehicle for each senior staff position which we added.

For projecting requirements for 1980 and 1981 we have used average figures per senior staff member rather than trying to prepare detailed lists. The averages used are $7,000 per annum for two years for each new staff member and $4,000 per annum for established staff members.

## BUILDING AND INSTALLATIONS

The major part of additional buildings needed to accommodate existing staff and those who will be added in the immediate future have been included in the 1977 and earlier years' budgets. Although not all these

buildings are built, or in some cases even started, we hope to have most of them completed within the next year.

## Station Operations Building

Construction will soon start on the first phase of a new station operations building for which funds were provided in 1976 and 1977. As projected in the 1976 and 1977 budgets, capital funds are now requested for 1979 for the second phase of this building.

This phase of the building will provide work space for 13 senior scientists and offices for 8 senior scientists and 12 professional support staff. There will be 468 square meters of office space, 936 square meters of work area, and 1,404 square meters of patio of which 468 will be covered. Total constructed area will be about 1;900 square meters.

## Greenhouse

In 1977 we will build the two greenhouses which were approved in the budget. This will still leave the third additional greenhouse to be built in 1978 as projected although at a somewhat lower cost. A request has been made to the Consultative Group to use surplus funds from 1976 for the construction of a phytosanitary greenhouse.

## Building Modifications

We are including again in 1978 (which will be the year when most of our construction will be complete) a sum of $35,000 for modifications to buildings when programs and staff are moved from one area to another, as additional space becomes available.

## Allic Soil Sub-Station (at Santander)

Negotiations for the acquisition of the sub-station site (at a nominal rent) are complete and work has started on the necessary land preparations and installations. A detailed list supporting funds provided in 1977 and requested for later years has been prepared. Major items are as follows:

| | |
|---|---|
| Deep well and pump | $45,000 |
| Roads | 20,000 |
| Irrigation system | 20,000 |
| Farm machinery | 42,000 |
| Furniture and equipment | 20,000 |
| Vehicle (pick-up) | 8,000 |
| | $155,000 |

Funds provided or requested are as follows:

| | |
|---|---|
| 1977 | $80,000 |
| 1978 | 50,000 |
| 1979 | 25,000 |
| | $155,000 |

## SUMMARY OF CAPITAL REQUIREMENTS

| | Budget | | | Projection | | |
|---|---|---|---|---|---|---|
| | 1978 | 1979 | Total | 1980 | 1981 | Total |
| **Category I Projects** | | | | | | |
| Station Operations Building (Second Phase) | | 305,000 | 305,000 | | | |
| Greenhouse | 40,000 | | 40,000 | | | |
| Building modifications | 35,000 | | 35,000 | | | |
| Allic Soil Sub-station (Santander) | 50,000 | 25,000 | 75,000 | 25,000 | | 25,000 |
| **Category II Projects** | | | | | | |
| Equipment and other needs specific to programs (see following table) | 542,000 | 326,000 | 868,000 | 460,000 | 342,000 | 802,000 |
| **Grand Total** | 667,000 | 656,000 | 1,323,000 | 485,000 | 342,000 | 827,000 |

# SPECIFIC EQUIPMENT AND OTHER CAPITAL REQUIREMENTS OF PROGRAMS

## Category II Expenditures

| | Budget | | | Projection | | |
|---|---|---|---|---|---|---|
| | 1978 | 1979 | Total | 1980 | 1981 | Total |
| **Beans** | | | | | | |
| Seed counter | 4,000 | | | | | |
| Nursery thresher | 3,000 | | | | | |
| Net radiometers (4) | 2,000 | | | | | |
| Laminar flow hood (shared with Beef) | 3,000 | | | | | |
| Stereo microscopes (2) | 2,600 | | | | | |
| Spectronic 20 | 1,000 | | | | | |
| Stirring plate | 300 | | | | | |
| Refrigerator | 1,000 | | | | | |
| Incubators (2) | 1,000 | 1,000 | | | | |
| Freezer | 600 | 600 | | | | |
| Bulk seed dryer | 5,000 | | | | | |
| Glasshouse (Popayán) | 4,000 | | | | | |
| Tractor mounted small plot seeder | | 4,000 | | | | |
| Analytical balance | | 1,500 | | | | |
| Compressor | | 500 | | | | |
| Electronic plate colony counter | | 5,000 | | | | |
| Environmental cabinet | | 5,000 | | | | |
| D-vac sampler | | 500 | | | | |
| Toledo balance | | 1,400 | | | | |
| Digital recorder unit | | 5,000 | | | | |
| Sundries | 5,500 | 8,500 | | | | |
| | 33,000 | 33,000 | 66,000 | 58,000 | 65,000 | 123,000 |
| **Beef** | | | | | | |
| Gravely small plot forage harvester (2) | 1,500 | 1,500 | | | | |
| Forced-draft drying ovens (3) | 6,000 | 3,000 | | | | |
| Small plot mowers (2) | 800 | 800 | | | | |
| Toledo balances (2) | 900 | 900 | | | | |
| Bicycles (5) | 600 | - | | | | |
| Screenhouses (Cerrado) | 2,000 | 4,000 | | | | |
| Planting equipment and attachments | 1,200 | 1,200 | | | | |
| Humidifiers (6) | 300 | 300 | | | | |
| Microscope, binocular | 1,500 | - | | | | |
| Microscope, dissecting binocular | - | 3,000 | | | | |
| Microniser | 800 | - | | | | |
| Solar drying rack | 300 | - | | | | |
| Boom sprayer | - | 500 | | | | |

| | Budget | | | Projection | | |
|---|---|---|---|---|---|---|
| | 1978 | 1979 | Total | 1980 | 1981 | Total |
| Custom-made seed production equipment | - | 850 | | | | |
| Custom-made pasture development seeders | 1,500 | 1,500 | | | | |
| Custom-made tillage equipment | 1,100 | 1,100 | | | | |
| Sickle bar mower, 3-points (2) | 1,000 | 1,000 | | | | |
| Freeze-drier | 2,000 | - | | | | |
| Water bath | 800 | - | | | | |
| Calculators (5) | 800 | 400 | | | | |
| Wall cases (10) | 1,500 | - | | | | |
| Floor cases (4) | 1,600 | - | | | | |
| Forage laboratory and greenhouse equipment | 1,000 | 1,000 | | | | |
| Laboratory seed cleaner | - | 600 | | | | |
| Soil moisture equipment | 2,000 | 1,500 | | | | |
| Soil sampling equipment | 300 | 400 | | | | |
| Soil physical resistance equipment | 500 | 450 | | | | |
| Soil chemistry equipment | 2,000 | 1,000 | | | | |
| Miscellaneous equipment for 15 present senior staff | 15,000 | 15,000 | | | | |
| Unspecified equipment for 4 new staff positions | 20,000 | 20,000 | | | | |
| | 67,000 | 60,000 | 127,000 | 79,000 | 93,000 | 172,000 |
| **Cassava** | | | | | | |
| Barbed wire | 2,000 | | | | | |
| Dust-free greenhouse cooler | 1,500 | | | | | |
| Microscopes (2) | 1,500 | 1,500 | | | | |
| Dew point humidity analyzer | 4,000 | 4,500 | | | | |
| Growth chambers (2) | 4,000 | 4,500 | | | | |
| Mite screenhouse | 2,500 | - | | | | |
| Light rooms (2) | 2,000 | 2,000 | | | | |
| Balances | | 2,000 | | | | |
| Sundries | 7,500 | 7,500 | | | | |
| | 25,000 | 22,000 | 47,000 | 36,000 | 40,000 | 76,000 |
| **Rice** | | | | | | |
| Spectrophotometer | 700 | | | | | |
| Constant temperature water bath | 400 | | | | | |
| Mettler balance (H18) | 950 | | | | | |
| Ovens (2) | 600 | | | | | |
| Agitator | 200 | | | | | |
| Water still | 450 | | | | | |
| Hot plates | 150 | | | | | |
| Polisher motor | 200 | | | | | |
| Two-wheeled tractor with puddling and leveling equipment | 2,000 | 2,000 | | | | |
| Seed cleaners (3) | 800 | | | | | |
| Toledo scales (2) | 650 | | | | | |

| | Budget | | | Projection | | |
|---|---|---|---|---|---|---|
| | 1978 | 1979 | Total | 1980 | 1981 | Total |
| Nursery or plot thresher | | 1,300 | | | | |
| Test plot thresher | 1,800 | | | | | |
| Incubators | 2,500 | 2,500 | | | | |
| Balances | 500 | 1,000 | | | | |
| Micronisers | 700 | 700 | | | | |
| Oven and stirrers | 1,000 | | | | | |
| Sundries | 400 | 8,500 | | | | |
| | 14,000 | 16,000 | 30,000 | 12,000 | 14,000 | 26,000 |
| **Swine** | | | | | | |
| Molasses mixing machine | 2,000 | | | | | |
| Sundries | 5,000 | 8,000 | | | | |
| | 7,000 | 8,000 | 15,000 | 8,000 | 9,000 | 17,000 |
| **Genetic Resources** | | | | | | |
| Environmental growth chamber | 11,000 | | | | | |
| Laminar flow hood | 7,000 | | | | | |
| Spectrophotometer | | 4,000 | | | | |
| Scanning densitometer | | 3,000 | | | | |
| Shaker incubator | | 6,000 | | | | |
| Flasks and accessories for storage at liquid nitrogen temperatures | | 2,000 | | | | |
| | 18,000 | 15,000 | 33,000 | 12,000 | 13,000 | 25,000 |
| **Special Studies** | | | | | | |
| Plot threshers | 1,000 | | | | | |
| Micronisers | 700 | | | | | |
| Rototillers | | 800 | | | | |
| Sundries | 1,300 | 1,200 | | | | |
| | 3,000 | 2,000 | 5,000 | 4,000 | 5,000 | 9,000 |
| **Station Operations** | | | | | | |
| Extension of irrigation system | 5,000 | 12,000 | | | | |
| Asphalting of roads | 10,000 | 12,000 | | | | |
| Irrigation and drainage equipment | 5,000 | 12,000 | | | | |
| Net for limits of lots | 10,000 | 4,000 | | | | |
| Tractor | | 10,000 | | | | |
| | 30,000 | 50,000 | 80,000 | 40,000 | 40,000 | 80,000 |
| **Service Laboratories** | | | | | | |
| Radioisotope counting equipment | 20,000 | 20,000 | | | | |
| Sundries (magnifier, digital multimeter, audio-generator, soldering equipment, voltage probes) | 3,000 | 2,000 | | | | |
| | 23,000 | 22,000 | 45,000 | 5,000 | 5,000 | 10,000 |

| | Budget | | | Projection | | |
|---|---|---|---|---|---|---|
| | 1978 | 1979 | Total | 1980 | 1981 | Total |
| **Greenhouses** | | | | | | |
| Soil sterilizer | 5,000 | | | | | |
| Soil blender | 1,000 | | | | | |
| Benches (4) | 3,000 | | | | | |
| Water de-ionizer | 1,000 | | | | | |
| Sundries | 10,000 | | | | | |
| | 20,000 | | 20,000 | 5,000 | 5,000 | 10,000 |
| **Training and Conferences** | | | | | | |
| Microscopes for trainees (16) | 1,600 | | | | | |
| Filmstrip projector | 200 | | | | | |
| Furniture for conference room | 5,900 | | | | | |
| Dissolving unit for slide projector | 200 | | | | | |
| Video-cassette playback unit | 1,500 | | | | | |
| Color receiver | 600 | | | | | |
| Control boards (4) | 2,000 | | | | | |
| Portable calculators (12) and typewriters (4) for trainees | 2,000 | 1,000 | | | | |
| Sundries | 2,000 | 3,000 | | | | |
| | 16,000 | 4,000 | 20,000 | 8,000 | 9,000 | 17,000 |
| **Library and Information Services** | | | | | | |
| Video-tape production equipment | 45,500 | | | | | |
| Photo laboratory accessories | 1,500 | 1,000 | | | | |
| Books | 25,000 | 25,000 | | | | |
| Microfilm cabinet and accessories | 2,000 | | | | | |
| Card files | 1,000 | 1,000 | | | | |
| | 75,000 | 27,000 | 102,000 | 20,000 | 20,000 | 40,000 |
| **Executive Officer** | | | | | | |
| Dictaphone | 500 | | | | | |
| Refrigerator (Bogotá) | 500 | | | | | |
| Furniture and furnishings for all CIAT programs: | | | | | | |
| Senior staff and postdoctorals | 14,000 | 4,000 | | | | |
| Scientific and Supervisory | 13,000 | 4,000 | | | | |
| Clerical | 15,000 | 2,000 | | | | |
| Students | 3,000 | | | | | |
| Vehicles for new staff | | | | | | |
| Senior staff | 93,000 | 18,000 | | | | |
| Postdoctorals | 34,000 | 18,000 | | | | |
| | 173,000 | 46,000 | 219,000 | 155,000 | 6,000 | 161,000 |

| | Budget | | | Projection | | |
|---|---|---|---|---|---|---|
| | 1978 | 1979 | Total | 1980 | 1981 | Total |
| **Controller** | | | | | | |
| Computer output storage and handling equipment | 1,000 | 1,000 | 2,000 | 1,000 | 1,000 | 2,000 |
| **Physical Plant** | | | | | | |
| Lathe | 400 | | | | | |
| Welder | 2,000 | | | | | |
| Trailer | 250 | | | | | |
| Vacuum cleaner | 800 | | | | | |
| Floor cleaner | 1,500 | | | | | |
| Tricycles (2) | 300 | | | | | |
| Tractor (grass cutter) | 2,500 | | | | | |
| Sundries | 1,250 | 4,000 | | | | |
| | 9,000 | 4,000 | 13,000 | 5,000 | 5,000 | 10,000 |
| **Motor and Tractor Pool** | | | | | | |
| Wheel balancing equipment | 1,500 | | | | | |
| Headlight aiming equipment | 200 | | | | | |
| Valve and seat grinding equipment | 2,500 | | | | | |
| Engine analyzer | 3,000 | | | | | |
| Alternator/generator tester | 800 | | | | | |
| F-250 double cabin pick-ups (2) | 11,000 | 12,000 | | | | |
| Precision shop equipment | 2,000 | 2,000 | | | | |
| Tractor tools | 2,000 | 1,000 | | | | |
| | 23,000 | 15,000 | 38,000 | 10,000 | 10,000 | 20,000 |
| **Food and Housing** | | | | | | |
| Apartment fans | 1,200 | | | | | |
| Floor polishers (2) | | 500 | | | | |
| Laundry trolleys (4) | 400 | 500 | | | | |
| Iron | 1,400 | | | | | |
| Clothes dryer (50 lb) | 2,000 | | | | | |
| | 5,000 | 1,000 | 6,000 | 2,000 | 2,000 | 4,000 |
| **Total Equipment** | 542,000 | 326,000 | 868,000 | 460,000 | 342,000 | 802,000 |

# Appendix Tables

CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

SUMMARY OF MAN-YEARS AND COSTS BY PROGRAM AND ACTIVITY

TABLE I

| | Actual 1975 | | Actual 1976 | | Original 1977 | | Revised 1977 | | Proposed Budget 1978 | | 1979 | | Total | | Projections 1980 | | 1981 | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | * M-Y | $ 000 | M-Y | $ 000 | M-Y | $ 000 | M-Y | $ 000 | M-Y | $ 000 | M-Y | $ 000 | M-Y | $ 000 | M-Y | $ 000 | M-Y | $ 000 | M-Y | $ 000 |
| RESEARCH ACTIVITIES | | | | | | | | | | | | | | | | | | | | |
| Major Programs | | | | | | | | | | | | | | | | | | | | |
| Beans | 6.4 | 517 | 7.5 | 698 | 9.5 | 1032 | 9.0 | 995 | 10.5 | 969 | 11.0 | 1007 | 21.5 | 1976 | 12.5 | 1126 | 13.0 | 1172 | 25.5 | 2298 |
| Beef | 9.0 | 813 | 8.1 | 831 | 13.5 | 1474 | 13.6 | 1412 | 18.5 | 1700 | 19.0 | 1847 | 37.5 | 3547 | 20.0 | 2023 | 20.0 | 2061 | 40.0 | 4084 |
| Cassava | 6.4 | 413 | 6.9 | 573 | 7.5 | 790 | 6.6 | 746 | 8.5 | 820 | 9.0 | 887 | 17.5 | 1707 | 10.0 | 968 | 10.0 | 979 | 20.0 | 1947 |
| SUB-TOTAL | 21.8 | 1743 | 22.5 | 2102 | 30.5 | 3296 | 29.2 | 3153 | 37.5 | 3489 | 39.0 | 3741 | 76.5 | 7230 | 42.5 | 4117 | 43.0 | 4212 | 85.5 | 8329 |
| Associated Units | | | | | | | | | | | | | | | | | | | | |
| Rice | 2.9 | 201 | 2.4 | 206 | 3.2 | 331 | 3.3 | 316 | 3.0 | 280 | 3.0 | 306 | 6.0 | 586 | 3.0 | 332 | 3.0 | 340 | 6.0 | 672 |
| Swine | 3.1 | 211 | 2.0 | 150 | 2.0 | 220 | 2.0 | 184 | 2.0 | 170 | 2.0 | 171 | 4.0 | 341 | 2.0 | 176 | 2.0 | 178 | 4.0 | 354 |
| Genetic Resources | - | - | | | 1.8 | 168 | 1.5 | 145 | 2.5 | 205 | 3.0 | 240 | 5.5 | 445 | 3.0 | 250 | 3.0 | 263 | 6.0 | 513 |
| Special Studies | | | | | - | - | 0.8 | 106 | 1.0 | 109 | 1.0 | 114 | 2.0 | 223 | 1.0 | 114 | 1.0 | 116 | 2.0 | 230 |
| Maize | 1.0 | 78 | | | - | - | | | | | | | | | | | | | | |
| Small Farm Systems | 2.0 | 160 | | | - | - | | | | | | | | | | | | | | |
| SUB-TOTAL | 9.0 | 650 | 4.4 | 356 | 7.0 | 719 | 7.6 | 751 | 8.5 | 764 | 9.0 | 831 | 17.5 | 1595 | 9.0 | 872 | 9.0 | 897 | 18.0 | 1769 |
| Support Units | | | | | | | | | | | | | | | | | | | | |
| Carimagua | | | | | | | | | | 150 | | 150 | | 300 | | 150 | | 150 | | 300 |
| Biometrics | .5 | 91 | 1.0 | 136 | 1.0 | 186 | 1.0 | 187 | 1.0 | 178 | 1.0 | 176 | 2.0 | 354 | 1.0 | 184 | 1.0 | 184 | - | 368 |
| Station Operations | | 178 | 1.0 | 235 | 1.0 | 268 | 1.0 | 244 | 1.0 | 296 | 1.0 | 325 | 2.0 | 621 | 1.0 | 344 | 1.0 | 353 | 2.0 | 697 |
| Service Laboratories | | 55 | | 65 | | 111 | | 98 | | 95 | | 106 | | 201 | | 115 | | 122 | | 237 |
| Greenhouses | | | | | | | | | | 10 | | 13 | | 23 | | 14 | | 14 | | 28 |
| SUB-TOTAL | .5 | 324 | 2.0 | 436 | 2.0 | 565 | 2.0 | 529 | 2.0 | 729 | 2.0 | 770 | 4.0 | 1499 | 2.0 | 807 | 2.0 | 823 | 4.0 | 1630 |
| Assoc. D.G. - Research | .1 | 4 | 1.9 | 166 | 2.0 | 309 | 1.0 | 188 | 1.0 | 190 | 1.0 | 189 | 2.0 | 379 | 1.0 | 189 | 1.0 | 189 | 2.0 | 378 |
| TOTAL RESEARCH ACTIVITIES | 31.4 | 2721 | 30.8 | 3060 | 41.5 | 4889 | 39.8 | 4621 | 49.0 | 5172 | 51.0 | 5531 | 100.0 | 10703 | 54.5 | 5985 | 55.0 | 6121 | 109.5 | 12106 |
| INTERNATIONAL COOP. ACTIVITIES | | | | | | | | | | | | | | | | | | | | |
| Associate D.G. - Intl. Coop. | | | 0.5 | 46 | 1.0 | 134 | 1.0 | 134 | 1.0 | 113 | 1.0 | 112 | 2.0 | 225 | 1.0 | 111 | 1.0 | 111 | 2.0 | 222 |
| Training & Conferences | | | | | | | | | | | | | | | | | | | | |
| Coordination & Instruction | 2.7 | 218 | 2.7 | 221 | 3.0 | 282 | 2.0 | 251 | 2.0 | 264 | 2.0 | 266 | 4.0 | 530 | 2.0 | 267 | 2.0 | 271 | 4.0 | 538 |
| Post Doctoral Fellows | | 7 | | 70 | | 88 | | 88 | | 166 | | 208 | | 374 | | 313 | | 313 | | 626 |
| Post Graduate Interns | | 152 | | 147 | | 142 | | 142 | | 165 | | 165 | | 330 | | 165 | | 165 | | 330 |
| Research Scholars | | 81 | | 73 | | 97 | | 97 | | 120 | | 160 | | 280 | | 200 | | 255 | | 455 |
| Conferences & Symposia | | 69 | | 77 | | 218 | | 214 | | 132 | | 132 | | 264 | | 132 | | 132 | | 264 |
| SUB-TOTAL | 2.7 | 527 | 2.7 | 588 | 3.0 | 827 | 2.0 | 792 | 2.0 | 847 | 2.0 | 931 | 4.0 | 1778 | 2.0 | 1077 | 2.0 | 1136 | 4.0 | 2213 |
| Library & Information Services | | | | | | | | | | | | | | | | | | | | |
| Library | | | 1.0 | 202 | 1.0 | 285 | 1.0 | 249 | 1.0 | 252 | 1.0 | 255 | 2.0 | 507 | 1.0 | 255 | 1.0 | 255 | 2.0 | 510 |
| Information Services | | | 2.4 | 284 | 2.0 | 357 | 2.0 | 343 | | | | | | | | | | | | |
| Public Information | | | | 29 | | - | | 35 | 2.5 | 389 | 3.0 | 428 | 5.5 | 817 | 3.0 | 433 | 3.0 | 438 | 6.0 | 871 |
| SUB-TOTAL | 3.8 | 438 | 3.4 | 515 | 3.0 | 642 | 3.0 | 627 | 3.5 | 641 | 4.0 | 683 | 7.5 | 1324 | 4.0 | 688 | 4.0 | 693 | 8.0 | 1381 |
| TOTAL INT.COOP.ACTIVITIES | 6.5 | 965 | 6.6 | 1149 | 7.0 | 1603 | 6.0 | 1553 | 6.5 | 1601 | 7.0 | 1726 | 13.5 | 3327 | 7.0 | 1876 | 7.0 | 1940 | 14.0 | 3816 |
| ADMINISTRATION | | | | | | | | | | | | | | | | | | | | |
| Director General | 2.0 | 197 | 1.0 | 119 | 1.0 | 128 | 1.0 | 130 | 1.0 | 123 | 1.0 | 122 | 2.0 | 245 | 1.0 | 122 | 1.0 | 122 | 2.0 | 244 |
| Executive Officer | .9 | 225 | 1.0 | 304 | 1.0 | 371 | 1.0 | 352 | 1.0 | 339 | 1.0 | 336 | 2.0 | 675 | 1.0 | 336 | 1.0 | 336 | 2.0 | 672 |
| Controller | 1.0 | 156 | 1.0 | 224 | 1.0 | 284 | 1.0 | 280 | 1.0 | 283 | 1.0 | 296 | 2.0 | 579 | 1.0 | 299 | 1.0 | 299 | 2.0 | 598 |
| Board of Trustees | | 20 | | 23 | | 35 | | 35 | | 38 | | 38 | | 76 | | 38 | | 38 | | 76 |
| TOTAL ADMINISTRATION | 3.9 | 598 | 3.0 | 670 | 3.0 | 818 | 3.0 | 797 | 3.0 | 783 | 3.0 | 792 | 6.0 | 1575 | 3.0 | 795 | 3.0 | 795 | 6.0 | 1590 |
| GENERAL OPERATING EXPENSES | | | | | | | | | | | | | | | | | | | | |
| Physical Plant | | 376 | | 386 | | 540 | | 569 | | 537 | | 542 | | 1079 | | 547 | | 552 | | 1099 |
| Motor & Tractor Pool | | 158 | | 257 | | 269 | | 298 | | 342 | | 344 | | 686 | | 350 | | 356 | | 706 |
| General Expenses | | 452 | | 356 | | 410 | | 410 | | 419 | | 424 | | 843 | | 424 | | 424 | | 848 |
| TOTAL GENERAL OPERATING | | 986 | | 999 | | 1219 | | 1277 | | 1298 | | 1310 | | 2608 | | 1321 | | 1332 | | 2653 |
| OTHER | | | | | | | | | | | | | | | | | | | | |
| Contingency | | | | | | 85 | | 82 | | 89 | | 94 | | 183 | | 99 | | 101 | | 200 |
| Provision for Price Changes | | | | | | | | | | 1116 | | 2459 | | 3575 | | 3590 | | 4979 | | 8569 |
| TOTAL CORE | 41.8 | 5270 | 40.4 | 5878 | 51.5 | 8614 | 48.8 | 8330 | 58.5 | 10059 | 61.0 | 11912 | 119.5 | 21971 | 64.5 | 13666 | 65.0 | 15268 | 129.5 | 28934 |
| TOTAL SPECIAL PROJECTS | | 613 | | 710 | | 1750 | | 1310 | | 1350 | | 1400 | | 2750 | | 1450 | | 1500 | | 2950 |
| CATEGORIES OF EXPENSE | | | | | | | | | | | | | | | | | | | | |
| Personal Services | | 3705 | | 4230 | | 5984 | | 5731 | | 6383 | | 6735 | | 13118 | | 7160 | | 7256 | | 14416 |
| Supplies | | 566 | | 619 | | 857 | | 853 | | 896 | | 939 | | 1835 | | 983 | | 993 | | 1976 |
| Services | | 453 | | 505 | | 744 | | 720 | | 707 | | 724 | | 1431 | | 752 | | 761 | | 1513 |
| Travel | | 346 | | 327 | | 686 | | 686 | | 600 | | 626 | | 1226 | | 671 | | 681 | | 1352 |
| Equipment | | 22 | | 114 | | 180 | | 180 | | 196 | | 263 | | 459 | | 339 | | 425 | | 764 |
| Other | | 178 | | 83 | | 78 | | 78 | | 72 | | 72 | | 144 | | 72 | | 72 | | 144 |
| Contingency | | | | | | 85 | | 82 | | 89 | | 94 | | 183 | | 99 | | 101 | | 200 |
| SUB-TOTAL | | 5270 | | 5878 | | 8614 | | 8330 | | 8943 | | 9453 | | 18396 | | 10076 | | 10289 | | 20365 |
| Provision for Price Changes | | - | | | | - | | | | 1116 | | 2459 | | 3575 | | 3590 | | 4979 | | 8569 |
| TOTAL CORE | | 5270 | | 5878 | | 8614 | | 8330 | | 10059 | | 11912 | | 21971 | | 13666 | | 15268 | | 28934 |

* M-Y = Man-years of senior staff.

6/6/77

CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

TABLE II

SUMMARY OF SOURCES AND APPLICATION OF FUNDS

| | ACTUAL 1975 | ACTUAL 1976 | 1977 Original | 1977 Revised | BUDGET 1978 | BUDGET 1979 | BUDGET Total | PROJECTION 1980 | PROJECTION 1981 | PROJECTION Total |
|---|---|---|---|---|---|---|---|---|---|---|
| SOURCES OF FUNDS | | | | | | | | | | |
| Core Operations | | | | | | | | | | |
| Unrestricted | | | | | | | | | | |
| Australia | | | | 140 | | | | | | |
| Belgium | | | | 140 | | | | | | |
| Canada (CIDA) | | | | 937 | | | | | | |
| Ford Foundation | 625 | 400 | | 300 | | | | | | |
| Germany (Federal Republic) | | | | 601 | | | | | | |
| Interamerican Development Bank | 1645 | 1900 | | 2167 | | | | | | |
| Netherlands | | | | 40 | | | | | | |
| Rockefeller Foundation | 600 | 500 | | 400 | | | | | | |
| United Nations Environment Programme | 70 | | | | | | | | | |
| United States (USAID) | 1230 | 1700 | | 2238 | | | | | | |
| World Phosphate Rock Institute | 10 | | | | | | | | | |
| Unidentified sources | | | 8264 | 240 | 9659 | 11512 | 21171 | 13266 | 14868 | 28134 |
| Balance from previous year | 32 | 303 | | 377 | - | | - | | | |
| Income applied in year | 271 | - | 350 | 350 | 400 | 400 | 800 | 400 | 400 | 800 |
| SUB-TOTAL | 4483 | 4803 | 8614 | 7930 | 10059 | 11912 | 21971 | 13666 | 15268 | 28934 |
| Restricted | | | | | | | | | | |
| Japan (Cassava)* | | | | 150 | | | | | | |
| Canada (CIDA) (Cassava & Swine) | 800 | 845 | | | | | | | | |
| W.K. Kellogg Foundation (Training & Conference) | 290 | 300 | | 310 | | | | | | |
| SUB-TOTAL | 1090 | 1145 | | 460 | | | | | | |
| TOTAL CORE OPERATING FUNDS | 5573 | 5948 | 8614 | 8390 | 10059 | 11912 | 21971 | 13666 | 15268 | 28934 |
| Capital | | | | | | | | | | |
| Australia | | 125 | | | | | | | | |
| Belgium | | 135 | | | | | | | | |
| Germany (Federal Republic) | 344 | 636 | | | | | | | | |
| Interamerican Development Bank | 100 | 200 | | 228 | | | | | | |
| International Development Assoc. (World Bank) | | 250 | | 475 | | | | | | |
| Netherlands | 175 | 200 | | 160 | | | | | | |
| Rockefeller Foundation | - | 15 | | | | | | | | |
| Switzerland | 115 | 140 | | 180 | | | | | | |
| United Kingdom (ODM) | 23 | 106 | | 170 | | | | | | |
| Unidentified sources | | | 1377 | | 767 | 806 | 1573 | 535 | 542 | 1077 |
| Balance from previous year | 628 | 185 | | 1657 | - | - | - | - | - | - |
| Balance of working funds | 100 | 600 | 600 | 600 | 700 | 800 | 700 | 950 | 1000 | 950 |
| Income applied in year | 68 | 339 | | | | | | | | |
| Other | | 51 | | | | | | | | |
| TOTAL CAPITAL FUNDS | 1553 | 2982 | 1977 | 3470 | 1467 | 1606 | 2273 | 1485 | 1542 | 2027 |
| Special Projects | | | | | | | | | | |
| CIMMYT (CIDA) | | 73 | | | | | | | | |
| Interamerican Development Bank | 90 | 266 | | 400 | | | | | | |
| International Board for Plant Genetic Resources | 50 | 33 | | | | | | | | |
| International Development Research Centre | 66 | 181 | | 602 | | | | | | |
| Rockefeller Foundation | 136 | 95 | | 44 | | | | | | |
| United States (USAID) | 30 | 27 | | | | | | | | |
| Ford Foundation | 47 | | | | | | | | | |
| United Kingdom | 79 | | | | | | | | | |
| International Fertilizer Dev. Center | 15 | | | | | | | | | |
| International Minerals & Chemical Corp. | 25 | | | | | | | | | |
| United National Development Program | | | | 200 | | | | | | |
| Other | 55 | 50 | | | | | | | | |
| Unidentified sources | | | 1750 | 50 | 1368 | 1400 | 2768 | 1450 | 1500 | 2950 |
| Balances from previous year | 301 | 281 | 300 | 296 | 282 | 300 | 282 | 300 | 300 | 300 |
| TOTAL SPECIAL PROJECTS | 894 | 1006 | 2050 | 1592 | 1650 | 1700 | 3050 | 1750 | 1800 | 3250 |
| TOTAL FUNDS | 8020 | 9936 | 12641 | 13452 | 13176 | 15218 | 27294 | 16901 | 18610 | 34211 |
| APPLICATION OF FUNDS | | | | | | | | | | |
| Core Operations | 5270 | 5878 | 8614 | 8330 | 10059 | 11912 | 21971 | 13666 | 15268 | 28934 |
| TAC Quinquennial Review | | | | 60 | | | | | | |
| Capital | 768 | 418 | 977 | 2770 | 667 | 656 | 1323 | 485 | 342 | 827 |
| Special Projects | 613 | 710 | 1750 | 1310 | 1350 | 1400 | 2750 | 1450 | 1500 | 2950 |
| Unexpended balances : | | | | | | | | | | |
| a) Unrestricted Core | 303 | 70 | | - | - | - | - | - | - | - |
| b) Capital | 185 | 1964 + | | - | - | - | - | - | - | - |
| c) Working Funds | 600 | 600 | 1000 | 700 | 800 | 950 | 950 | 1000 | 1200 | 1200 |
| d) Special Projects | 281 | 296 | 300 | 282 | 300 | 300 | 300 | 300 | 300 | 300 |
| e) Total | 1369 | 2930 | 1300 | 982 | 1100 | 1250 | 1250 | 1300 | 1500 | 1500 |
| TOTAL APPLICATIONS | 8020 | 9936 | 12641 | 13452 | 13176 | 15218 | 27294 | 16901 | 18610 | 34211 |
| Memo : | | | | | | | | | | |
| 1. Total Core Operating Funds Required | | | 8614 | 8390 | 10059 | 11912 | 21971 | 13665 | 15268 | 28934 |
| Less Unexpended balance from previous year | | | ( 217) | ( 377) | - | | - | | | |
| Less Earned Income Applied from current year | | | ( 350) | ( 350) | ( 400) | ( 400) | ( 800) | ( 400) | ( 400) | ( 800) |
| Net Core Operating Funds Required from CG Donors | | | 8047 | 7663 | 9659 | 11512 | 21171 | 13266 | 14868 | 28134 |
| Total Capital Funds Required | | | 1977 | 3470 | 1467 | 1606 | 3073 | 1485 | 1542 | 3027 |
| Less Unexpended balance from previous year | | | - | (1657) | - | - | - | - | - | - |
| Less Balance of Working Funds | | | ( 600) | ( 600) | ( 700) | ( 800) | (1500) | ( 950) | (1000) | (1950) |
| Less Earned Income Applied from current year | | | - | | | | | | | |
| Net Capital Funds Required from CG Donors | | | 1377 | 1213 | 767 | 806 | 1573 | 535 | 542 | 1077 |
| Total Funds Required from CG Donors | | | 9424 | 8876 | 10426 | 12318 | 22744 | 13801 | 15410 | 29211 |
| 2. Total Earned Income in current year | | | 350 | 350 | 400 | 400 | 800 | 400 | 400 | 800 |
| Applied to Core Operations | | | ( 350) | ( 350) | ( 400) | ( 400) | ( 800) | ( 400) | ( 400) | ( 800) |
| Applied to Capital | | | | | | | | | | |
| Balance carried forward | | | - | - | - | - | - | - | - | - |

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\+ The balance is carried forward to 1977 as $307,000 to operations and $1,657,000 to capital.

* The CG Secretariat has advised that Japan has pledged $150,000 but we have no further information. In earlier correspondence we had understood from the Japanese that their contribution would be restricted to funding for Cassava so for the time being it is being shown as restricted core.

TABLE III

## CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

### SUMMARY FINANCIAL DATA 1975 - 1979

( US $ Thousands )

| | Actual 1975 | Actual 1976 | Original 1977 | Revised 1977 | Budget 1978 | Budget 1979 |
|---|---|---|---|---|---|---|
| **Current Assets** | | | | | | |
| Cash | 1152 | 1481 | 644 | 424 | 500 | 600 |
| Receivable from Donors | 607 | 1616 | 750 | 663 | 700 | 700 |
| Receivable from Employees | 66 | 57 | 130 | 75 | 60 | 70 |
| Receivable from Others | 311 | 425 | 500 | 500 | 500 | 500 |
| Inventories | 250 | 345 | 300 | 350 | 370 | 350 |
| Prepaid Expenses | 5 | 11 | 20 | 20 | 20 | 30 |
| Total Current Assets | 2391 | 3935 | 2344 | 2032 | 2150 | 2250 |
| **Fixed Assets** | | | | | | |
| Research Equipment | 1721 | 1963 | | | | |
| Vehicles | 923 | 834 | | | | |
| Furnishings and Office Equipment | 930 | 938 | | | | |
| Buildings | 4495 | 4773 | | | | |
| Other | 46 | 25 | | | | |
| Total Fixed Assets | 8115 | 8533 | 10326 | 11303 | 11970 | 12626 |
| TOTAL ASSETS | 10506 | 12468 | 12670 | 13335 | 14120 | 14876 |
| **Liabilities** | | | | | | |
| Bank Overdraft | 14 | 18 | - | - | - | - |
| Accounts Payable | 758 | 807 | 844 | 850 | 800 | 700 |
| Total Current Liabilities | 772 | 825 | 844 | 850 | 800 | 700 |
| **Grants Received in Advance** | 250 | 180 | 200 | 200 | 250 | 300 |
| **Fund Balances** | | | | | | |
| Invested in Fixed Assets | 8115 | 8533 | 10326 | 11303 | 11970 | 12626 |
| Unexpended Funds : | | | | | | |
| Core Unrestricted | 303 | 70 | - | - | - | - |
| Working Fund Grants | 600 | 600 | 1000 | 700 | 800 | 950 |
| Capital Grants | 185 | 1964 | - | - | - | - |
| Special Projects | 281 | 296 | 300 | 282 | 300 | 300 |
| Total Fund Balances | 9484 | 11463 | 11626 | 12285 | 13070 | 13876 |
| TOTAL LIABILITIES & FUND BALANCES | 10506 | 12468 | 12670 | 13335 | 14120 | 14876 |

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RESEARCH ACTIVITIES

Major Programs

Beans
Beef
Cassava

SUB-TOTAL

Associated Units

* Rice
Swine
Genetic Resources
Special Studies +

SUB-TOTAL

Support Units

Carimagua
Biometrics
Station Operations
Service Laboratories
Greenhouses

SUB-TOTAL

Associate D.G. - Research +

TOTAL RESEARCH ACTIVI

INTERNATIONAL COOP. ACTIVITI

Associate D.G.- Intl. Cooper
Training and Conferences
Library and Information Servic

TOTAL INT.COOP.ACTIV

ADMINISTRATION

Director General
Executive Office
Controller

TOTAL ADMINISTRATION

GENERAL OPERATING

Physical Plant
Motor and Tractor Pool
Food and Housing
Farm Production

TOTAL GENERAL OPERAT

GRAND TOTAL
Less Vacancy Factors

NET TOTAL

Does not include IRRI funded
Special Studies is included wi

TABLE V

# *CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL*

## *1979 CAPITAL BUDGET*

PROJECT: Station Operations Building (Phase II)
TOTAL COST: $305,000
AREA: 1870 square meters

| CATEGORIES | | 1979 |
|---|---|---|
| 1. Advance Expenditures | | |
| 2. Land and Service Lines | | $ 3,750 |
| 3. Building | | |
| A. Earth work | 4,479 | |
| B. Foundations and framework | 47,191 | |
| C. Walls, roofing and other | 41,779 | |
| D. Carpentry work | 20,635 | |
| E. Finishes | 18,256 | |
| F. Sewers, piping, electrical and telephone | 24,083 | |
| G. Fittings | 21,156 | |
| *H. Site work (improvements) | 17,750 | |
| * I Air conditioning | 66,909 | |
| Building Costs | | $262,238 |
| 4. Consulting Services | | $ 11,000 |
| 5. Total before Contingencies | | $276,988 |
| 6. Contingencies (10%) | | $ 28,012 |
| Total Capital Cost | | $305,000 |

* Site work and air conditioning for Phases I and II are included in this budget.

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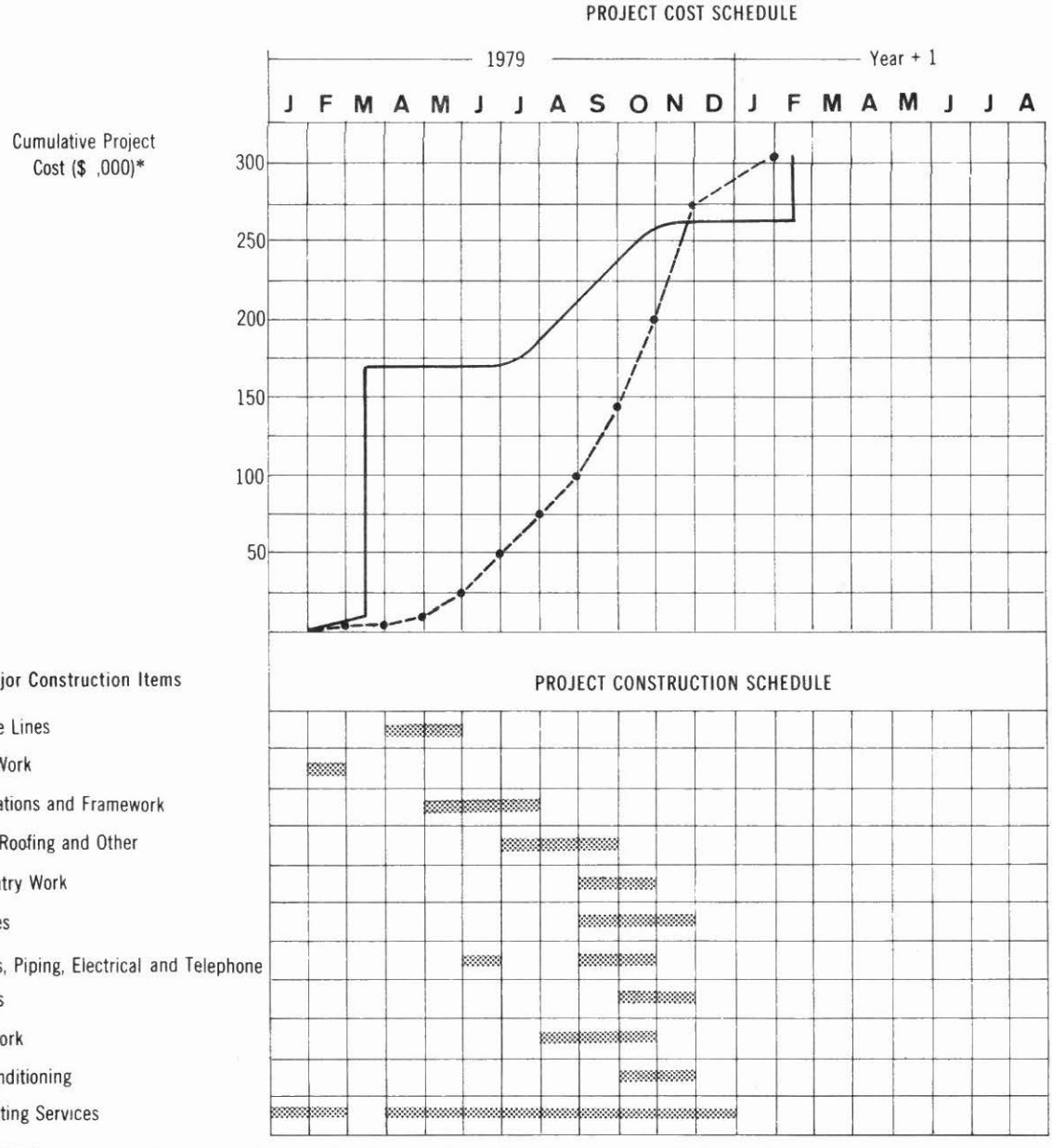
TABLE VI

# *CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL*

## *PROJECT TIME/COST ESTIMATE*

PROJECT: Station Operations Building (Phase II)
TOTAL COST: $305,000
AREA: 1870 square meters




* Two lines are *given in* the graph for the project cost. The continuous line shows payments, the broken line shows the cost of construction.

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TABLE VII

# CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

## PROJECTION OF POSITIONS AND MANPOWER

| | SENIOR STAFF | | | | | | | | | | SCIENTIFIC & SUPERVISORY STAFF | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1977 | | 1978 | | 1979 | | 1980 | | 1981 | | 1977 | | 1978 | | 1979 | | 1980 | | 1981 | |
| | * P | M-Y | P | M-Y | P | M-Y | P | M-Y | P | M-Y | P | M-Y | P | M-Y | P | M-Y | P | M-Y | P | M-Y |
| RESEARCH ACTIVITIES | | | | | | | | | | | | | | | | | | | | |
| Major Programs | | | | | | | | | | | | | | | | | | | | |
| Beans | 9.5 | 9.0 | 11 | 10.5 | 11 | 11.0 | 13 | 12.5 | 13 | 13.0 | 23 | 22.0 | 23 | 22.5 | 23 | 23.0 | 25 | 24.0 | 25 | 25.0 |
| Beef | 16 | 13.6 | 19 | 18.5 | 19 | 19.0 | 20 | 20.0 | 20 | 20.0 | 30 | 25.3 | 40 | 36.0 | 40 | 40.0 | 41 | 40.5 | 41 | 41.0 |
| Cassava | 7.5 | 6.6 | 9 | 8.5 | 9 | 9.0 | 10 | 10.0 | 10 | 10.0 | 15 | 14.3 | 18 | 16.5 | 19 | 18.5 | 21 | 21.0 | 21 | 21.0 |
| SUB-TOTAL | 33 | 29.2 | 39 | 37.5 | 39 | 39.0 | 43 | 42.5 | 43 | 43.0 | 68 | 61.6 | 81 | 75.0 | 82 | 81.5 | 87 | 85.5 | 87 | 87.0 |
| Associated Units | | | | | | | | | | | | | | | | | | | | |
| Rice | 4 | 3.3 | 3 | 3.0 | 3 | 3.0 | 3 | 3.0 | 3 | 3.0 | 8 | 6.3 | 6 | 6.1 | 7 | 6.8 | 7 | 7.0 | 7 | 7.0 |
| Swine | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 4 | 3.8 | 4 | 4.0 | 4 | 4.0 | 4 | 4.0 | 4 | 4.0 |
| Genetic Resources | 2 | 1.5 | 3 | 2.5 | 3 | 3.0 | 3 | 3.0 | 3 | 3.0 | 5 | 4.0 | 6 | 5.5 | 6 | 6.0 | 6 | 6.0 | 7 | 6.5 |
| Special Studies | 1 | 0.8 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 4 | 3.8 | 4 | 4.0 | 4 | 4.0 | 4 | 4.0 | 4 | 4.0 |
| SUB-TOTAL | 9 | 7.6 | 9 | 8.5 | 9 | 9.0 | 9 | 9.0 | 9 | 9.0 | 21 | 17.9 | 20 | 19.6 | 21 | 20.8 | 21 | 21.0 | 22 | 21.5 |
| Support Units | | | | | | | | | | | | | | | | | | | | |
| Carimagua | | | | | | | | | | | | | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 |
| Biometrics | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 5 | 5.0 | 5 | 5.0 | 5 | 5.0 | 5 | 5.0 | 5 | 5.0 |
| Station Operations | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 2 | 2.0 | 3 | 2.5 | 3 | 3.0 | 3 | 3.0 | 3 | 3.0 |
| Service Laboratories | | | | | | | | | | | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 |
| Greenhouses | | | | | | | | | | | | | | | | | | | | |
| SUB-TOTAL | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 8 | 8.0 | 11 | 10.5 | 11 | 11.0 | 11 | 11.0 | 11 | 11.0 |
| Associate D.G. - Research | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 0.7 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 |
| TOTAL RESEARCH ACTIVITIES | 45 | 39.8 | 51 | 49.0 | 51 | 51.0 | 55 | 54.5 | 55 | 55.0 | 98 | 88.2 | 113 | 106.1 | 115 | 114.3 | 120 | 118.5 | 121 | 120.5 |
| INTERNATIONAL COOP. ACTIVITIES | | | | | | | | | | | | | | | | | | | | |
| Assoc. D.G. - Intl. Cooperation | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | | | | | | | | | | |
| Training and Conferences | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 11 | 9.9 | 13 | 12.5 | 13 | 13.0 | 13 | 13.0 | 13 | 13.0 |
| Library and Information Services | 3 | 3.0 | 4 | 3.5 | 4 | 4.0 | 4 | 4.0 | 4 | 4.0 | 18 | 17.8 | 18 | 18.0 | 19 | 18.5 | 19 | 19.0 | 19 | 19.0 |
| TOTAL INT. COOP. ACTIVITIES | 6 | 6.0 | 7 | 6.5 | 7 | 7.0 | 7 | 7.0 | 7 | 7.0 | 29 | 27.7 | 31 | 30.5 | 32 | 31.5 | 32 | 32.0 | 32 | 32.0 |
| ADMINISTRATION | | | | | | | | | | | | | | | | | | | | |
| Director General | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 |
| Executive Officer | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 10 | 9.5 | 10 | 10.0 | 10 | 10.0 | 10 | 10.0 | 10 | 10.0 |
| Controller | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 7 | 7.0 | 9 | 8.0 | 9 | 9.0 | 9 | 9.0 | 9 | 9.0 |
| TOTAL ADMINISTRATION | 3 | 3.0 | 3 | 3.0 | 3 | 3.0 | 3 | 3.0 | 3 | 3.0 | 18 | 17.5 | 20 | 19.0 | 20 | 20.0 | 20 | 20.0 | 20 | 20.0 |
| GENERAL OPERATING | | | | | | | | | | | | | | | | | | | | |
| Physical Plant | | | | | | | | | | | 3 | 3.0 | 3 | 3.0 | 3 | 3.0 | 3 | 3.0 | 3 | 3.0 |
| Motor and Tractor Pool | | | | | | | | | | | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 | 1 | 1.0 |
| Food and Housing | | | | | | | | | | | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 | 2 | 2.0 |
| TOTAL GENERAL OPERATING | | | | | | | | | | | 6 | 6.0 | 6 | 6.0 | 6 | 6.0 | 6 | 6.0 | 6 | 6.0 |
| GRAND TOTAL | 54 | 48.8 | 61 | 58.5 | 61 | 61.0 | 65 | 64.5 | 65 | 65.0 | 151 | 139.4 | 170 | 161.6 | 173 | 171.8 | 178 | 176.5 | 179 | 178.5 |
| Less Vacancy Factors | | | | 0.8 | | 0.9 | | 0.9 | | 0.9 | | | | 9.8 | | 10.4 | | 10.5 | | 10.6 |
| NET TOTAL | | | | 57.7 | | 60.1 | | 63.6 | | 64.1 | | | | 151.8 | | 161.4 | | 166.0 | | 167.9 |

* P = Positions M-Y = Man-Years

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