CIAT

1976 Program and Budget and Projections to 1980

CIAT

Draft for consideration at
the meeting of the Board of
Trustees, May 26 - 27, 1975

Centro Internacional de Agricultura Tropical

CIAT

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THE 1976 BUDGET REQUEST AND PROJECTIONS 1977 - 1980

The 1976 budget request amounts to $6,640,000 for core operations and $ 1,434,000 for capital. Earned income and other balances are estimated at $ 350,000 so the net request for funds amounts to $7,724,000 . The 1975 program and budget document projected $ 6,766,000 for core operations and $ 420,000 for capital. The absolute increase in core operations is relatively small because the Rice and Maize programs will be included in the IRRI and CIMMYT budgets as from 1976.

The following table shows the 1975 and 1976 figures :

		1975	1976	% Increase
		($ thousands)		
Core Operations		5,453	6,640	22
Capital		825	1,434	74
		6,278	8,074	
less earned income, etc.	*	268	350	29
	*	6,010	7,724	29

* These figures are now somewhat different in table II on page 5 of this document.

The following table analyses the difference between the revised 1975 and the proposed 1976 budgets :

		$ thousands	% Increase over 1975
	1975 Operating Budget	5,453	
1)	Cost of full year operation with level of activity assumed for end of 1975	164	3.0
2)	Inflation	654	12.0
3)	Expansion of programs		
	a) Additional senior staff	72	1.4
	b) Additional scientific & supervisory staff	27	0.5
	c) Additional other staff	43	0.8
	d) Additional supplies, services travel, etc.	190	3.5

		$ thousands	% Increase over 1975
4)	New activities		
	a) Senior staff	25	0.5
	b) Support costs	25	0.5
5)	Other increases		
	a) Reduced contingency	(94)	(1.7)
	b) Additional equipment replacement	81	1.5
	1976 Operating budget	6,640	22 %

The increase in 1976 over the 1975 budget are explained below :

1) 1975 has started with several unfilled senior staff positions and other vacancies at the lower levels. In addition almost all new positions in 1975 are budgeted for only part of the year-usually 9 months. The effect of having these positions filled for all of 1976 adds approximately $ 160,000 to the 1976 budget.

2) Over the last nine months inflation in Colombia has been running at a high rate (between 25 and 35 % per annum). To a certain extent this has been offset by a devaluation of the Colombian peso as compared with the US dollar of about 18 % . At the same time, inflation for imported supplies, travel, etc. has been running at the unusually high rate prevailing in many other parts of the world. Included in the 1976 proposals is an average 12 % for inflation. This is somewhat higher than that which many experts are predicting but we believe it to be realistic.

3 a) The following additional senior staff positions and their respective manpower for the expansion of programs are proposed for 1976 :

	Positions	Manyears
	Cassava - Agronomy / Cultural Practices	0.75
	Beans - Breeding	1.00
	- Pathology	0.50
*	Station Operations	1.00

* This is a regrading of the position for the Farm Superintendent.

3b) 5 additional research associates and assistants to give an additional 4 man-years are proposed for the various programs. Also 3 extra positions at this level are proposed for the administrative groups. This with the increase included in 4 b) will bring the total of scientific and supervisory staff to 126 which is approximately 2.8 per senior staff member .

3 c) 52 additional clerical staff and other support staff (laborers, drivers, etc.) are proposed for 1976.

3 d) Some of the increases in travel, supplies, services, etc. are caused by inflation and the full year effect of 1975 increases ; the increases here are to support the increases noted in 3 a) - c).

4 a) An additional senior staff position for Soil Microbiology in the Beef Program to give an additional 0.75 manyears is proposed as a new activity for 1976.

4 b) The cost for support staff and other expenses for the senior staff included in 4 a) is approximately $ 25,000.

5 a) A contingency amounting to 1 % of the total budget has been included.

5 b) An estimated $ 152,000 is included for the replacement of equipment.

Projections 1977 - 1980

All programs and support groups were asked to submit, in addition to their requirements for 1976, projections to 1980. Certain adjustments have been made to these requests but on the whole they have been included, as submitted, in the projections shown on tables I and II .

In 1974 a special committee of the Board of Trustees reviewed the organization and programs of CIAT. In November 1974, the new Director General took up his post. He was requested by the Board of Trustees to review CIAT's organization and make recommendations for change. These were presented to the Executive Committee at their meeting in February. The Executive Committee will be recommending that the Board of Trustees accept some of the Director General's proposals, however, certain others were not acted upon and the Director General was asked to carry out further in-depth reviews of the Beef, Swine and Small Farm Systems programs. Until these reviews are complete which in some cases will not be until 1976, it is difficult to make projections of staffing and costs and therefore the projections in this document should be viewed in this light.

CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

TABLE I

SUMMARY OF MAN YEARS AND COSTS BY PROGRAM AND ACTIVITY

(U.S.$ thousands)

	Actual 1973		Actual 1974		Approved Budget 1975		Revised Budget 1975		Proposed Budget 1976		PROJECTIONS 1977		1978		1979		1980	
	M/Y	COST	M/Y	COST	M/Y	COST	M/Y	COST	M/Y	COST	M/Y	COST	M/Y	COST	M/Y	COST	M/Y	COST
PROGRAMS																		
Beef	10.0	661	8.8	724	11.0	864	8.7	743	10.8	1,058	15.5	1,586	16.8	1,742	17.0	1,789	17.0	1,818
Swine	2.7	202	3.5	230	3.5	279	3.3	262	2.0	233	2.5	255	3.0	312	3.0	316	3.0	321
Cassava	5.4	330	6.0	399	6.3	455	5.4	375	6.2	578	8.5	811	10.2	977	11.0	1,083	11.0	1,116
Field Beans	4.2	262	4.9	374	6.2	496	5.4	408	7.0	590	9.5	861	10.0	946	10.0	961	10.0	976
Rice	2.4	135	2.0	133	2.1	153	3.0	223										
Maize	1.0	121	.8	83	1.1	100	1.0	90										
Small Farm Systems	.3	36	2.2	185	3.5	286	2.0	175	2.0	211	2.5	206	3.5	292	4.5	382	5.0	433
Production Economics							3.0	264	3.0	318	3.5	371	4.0	424	4.0	424	4.0	424
Total	26.0	1,747	28.2	2,128	33.7	2,633	31.8	2,540	31.0	2,988	42.0	4,090	47.5	4,693	49.5	4,955	50.0	5,088
Training and Conferences																		
++ Instruction, Coordination, etc.	4.0	258	5.0	409	6.0	483	3.0	255	3.0	317	3.5	370	4.0	393	4.0	395	4.0	396
Postgraduate Interns		54		66		150		90		128		128		128		128		128
Research Scholars & Fellows		77		86		100		65		53		53		53		53		53
Post Doctoral Fellows								20		74		74		80		80		80
Production Specialists								65		18		22		22		22		22
Conferences & Symposia Support		129		43		110		90		161		162		164		166		167
Total	4.0	518	5.0	604	6.0	843	3.0	585	3.0	751	3.5	809	4.0	840	4.0	844	4.0	846
Library & Information Services	1.0	139	1.0	192	1.0	191	3.8	434	3.0	513	3.0	559	3.0	561	3.0	565	3.0	567
Research Support Groups																		
Laboratory Services	1.0	48		78		32		45		55		55		55		55		55
Biometrics	.5	40	.5	68	.5	98	.5	88	1.0	161	1.0	175	1.0	176	1.0	177	1.0	178
Engineering	.4	38	1.0	67	.5	56												
Station Operations	.2	104		179		184		179	1.0	208	1.0	233	1.0	248	1.0	256	1.0	268
Total	2.1	230	1.5	342	1.0	370	.5	312	2.0	424	2.0	463	2.0	479	2.0	488	2.0	501
Administration																		
Office of the Director General and Associates	1.8	125	2.0	180	2.0	169	2.5	209	3.0	269	3.0	271	3.0	271	3.0	271	3.0	271
Visiting Scientists and Consultants										50		50		50		50		50
Support of Outreach Contract Staff										10		20		20		20		20
Executive Officer	1.0	155	.9	216	1.0	289	.9	248	1.0	329	1.0	342	1.0	347	1.0	352	1.0	357
Controller	.3	61	1.0	120	1.0	135	1.0	149	1.0	215	1.0	220	1.0	220	1.0	220	1.0	220
Board of Trustees		18		43		20		23		29		28		28		28		28
Total	3.1	359	3.9	559	4.0	613	4.4	629	5.0	902	5.0	931	5.0	936	5.0	941	5.0	946
General Operating Expenses																		
Physical Plant	.2	171		318		312		366		457		463		472		481		490
Motor Pool	.2	120		140		157		144		196		187		196		206		212
General Expenses		346		228		279		283		343		353		374		399		426
Total	.4	637		678		748		793		996		1,003		1,042		1,086		1,128
Contingency						55		160		66		80		90		90		90
GRAND TOTAL	36.6	3,630	39.6	4,503	45.7	5,453	43.5	5,453	44.0	6,640	55.5	7,935	61.5	8,641	62.5	8,969	64.0	9,166
Expense Categories																		
Personnel		2,442		3,112		3,912		3,846		4,665		5,739		6,206		6,393		6,467
Supplies		586		565		562		529		633		688		743		766		777
Services		318		385		446		429		547		573		620		638		647
Travel		284		337		356		368		506		580		629		648		657
Equipment				72		71		71		152		215		291		370		438
Other				32		51		50		71		80		62		64		65
Contingency						55		160		66		80		90		90		90
		3,630		4,503		5,453		5,453		6,640		7,935		8,641		8,969		9,166
Provision for future price changes (10%)		*		*		*		*		*		794		1,816		2,970		4,304
TOTAL CORE BUDGET		3,630		4,503		5,453		5,453		6,640		8,729		10,457		11,939		13,470
% Increase (excl. inflation)										22%		20%		7%		4%		2%

\+ M/Y equals man years of senior staff.
* Included in detailed figures.
++ Includes Information Services for all columns through " Approved Budget 1975 ".

May 6, 1975

CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL

TABLE II

SUMMARY OF SOURCES AND APPLICATION OF FUNDS

(US$ THOUSANDS)

	Actual 1973	Actual 1974	Approved Budget 1975	Proposed Rev. Budget 1975	Proposed Budget 1976	PROJECTIONS 1977	1978	1979	1980
SOURCES OF FUNDS									
Core Operations									
Unrestricted									
Ford Foundation	750	750		825					
Rockefeller Foundation	682	750		600					
U.S.A.I.D.	880	950		1230					
Government of the Netherlands	125	125		175					
Government of Switzerland	85								
Government of the Fed. Rep. of Germany	56								
International Development Assoc. (IDA)	210								
Interamerican Development Bank		900		1545					
U.N. Environment Programme				70					
Others	4								
Unidentified sources			5185		6290	8329	10057	11539	13070
Balance from previous year	(12)	(37)	2	32					
Income applied in year	169	67	316	136	350	400	400	400	400
SUB-TOTAL	2928	3585	5503	4413	6640	8729	10457	11939	13470
Restricted									
W.K. Kellogg Foundation (Training & Conferences)	290	280		280					
CIDA (Swine and Cassava)	500	750		800					
SUB-TOTAL	790	1030	-	1090					
TOTAL CORE OPERATING FUNDS	3715	4535	5503	5503	6640	8729	10457	11939	13470
Capital									
Rockefeller Foundation	1779	446							
Government of Switzerland		78		115					
United Kingdom		59		25					
International Development Assoc. (IDA)		600		110					
Interamerican Development Bank		160		180					
Government of the Fed. Rep. of Germany		89		290					
Unidentified sources			825	81	1434	1043	506	727	341
Balance from previous year	891	175		628					
Balance of working funds		100	100	100	600	600	900	900	1000
Income applied in year		76		104					
TOTAL CAPITAL FUNDS	2670	1715	925	1553	2034	1643	1306	1627	1341
Special Projects									
W.K. Kellogg Foundation	77								
Interamerican Development Bank	161	171		319					
IDRC - Canada	30	194	81	94					
U.S.A.I.D.				265					
United Kingdom		71		87					
Rockefeller Foundation	84	113	91	98					
Ford Foundation		69	43	25					
Others	52	14		40					
Unidentified sources			535	251	1567	1850	2050	2300	2550
Balances from previous year	10	104		301	83	150	250	300	350
Income applied in year		167							
TOTAL SPECIAL PROJECT FUNDS	414	903	750	1478	1650	2000	2300	2600	2900
TOTAL FUNDS	6802	7153	7178	8534	10324	12372	14063	16166	17711
APPLICATION OF FUNDS									
Core Operations	3630	4503	5453	5453	6640	8729	10457	11939	13470
Support of special projects			50	50					
'Prior years' adjustments	24								
Capital	2496	987	325	953	1434	843	406	627	141
Special Projects	310	602	750	1395	1500	1750	2000	2250	2500
Unexpended Balances									
a) Unrestricted Core	(37)	32							
b) Capital	175	628							
c) Working Funds	100	100	600	600	600	800	900	1000	1200
d) Special Projects	104	301		53	150	250	300	350	400
e) Total	342	1061	600	653	750	1050	1200	1350	1600
TOTAL APPLICATIONS	6902	7153	7178	8534	10324	12372	14063	16166	17711
Memo:									
1. Total Core Operating Funds Required				5503	6640	8729	10457	11939	13470
Less Unexpended Balance from previous year				(32)					
Less Earned Income Applied from current year				(136)	(350)	(400)	(400)	(400)	(400)
Net Core Operating Funds required from C.G. Donors				5335	6290	8329	10057	11539	13070
Total Capital Funds Required				1553	2034	1643	1306	1627	1341
Less Unexpended Balance from previous year				(628)					
Less Balance of Working Funds				(100)	(600)	(600)	(800)	(900)	(1000)
Less Earned Income Applied from current year				(104)					
Net Capital Funds Required from C.G. Donors				721	1434	1043	506	727	341
Total Funds Required from C.G. Donors				6056	7724	9372	10563	12266	13411
2. Total Earned Income in current year				240	350	400	400	400	400
Applied to Core Operations				(136)	(350)	(400)	(400)	(400)	(400)
Applied to Capital				(104)					
Balance Carried Forward				-	-	-	-	-	-

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CENTRO INTERNACIONAL DE AGRICULTURA TROPICAL — TABLE III

SUMMARY FINANCIAL DATA - 1971 - 1976

(US$ THOUSANDS)

	1971	1972	1973	1974	BUDGET 1975	BUDGET 1976
CURRENT ASSETS						
Cash	450	272	139	623	300	200
Receivable from Donors	471	499	497	531	500	500
Receivable from Employees	29	73	69	85	90	100
Receivable from Others	334	287	289	718	600	500
Inventories	7	54	100	199	200	200
Prepaid Expenses	-	17	5	8	10	10
Total Current Assets	1291	1202	1099	2164	1700	1510
FIXED ASSETS						
Revolving Fund Balances	51	64	42	94		
Equipment	618	758	802	1346		
Vehicles	257	314	305	568		
Furnishings and Office Equipment	236	369	378	901		
Buildings	1276	2359	3950	4429		
Other Fixed Assets	-	-	883	9		
Total Fixed Assets	2438	3864	6360	7347	8300	9800
TOTAL ASSETS	3729	5066	7459	9511	10000	11310
LIABILITIES						
Bank Overdraft	-	7	137	317	-	-
Accounts Payable	423	181	351	286	282	300
Payable to Donors	25	25	25	-	-	-
Other Liabilities	-	100	127	385	600	160
Total Liabilities	448	313	640	988	882	460
GRANTS RECEIVED IN ADVANCE			117	115	135	150
FUND BALANCES						
Capital Grants:						
Invested in Fixed Assets	2438	3864	6360	7347	8300	9800
Unexpended Funds (*Deficit*)						
Core —						
Unrestricted	77	(12)	(37)	32	-	-
Working Fund Grant			100	100	600	600
Capital Grants	703	891	175	628	-	-
Special Projects —						
Donors	63	35	144	301	83	300
Other		(25)	(40)			
	843	889	342	1061	683	900
Total Fund Balances	3281	4753	6702	8408	8983	10700
TOTAL LIABILITIES AND FUND BALANCES	3729	5066	7459	9511	10000	11310

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BEEF PRODUCTION SYSTEMS

Resources

* Staff

	Manyears 1975	Manyears 1976	Direct Research Costs $ thousands 1975	Direct Research Costs $ thousands 1976	% Incr.
Animal Science-N.S.Raun (Director)	.75	1.00	743	1058	42
Pastures & Forages Utilization-O.Paladines	1.00	1.00			
Agrostology - B. Grof	1.00	1.00			
Seed Production - J. Ferguson	1.00	1.00			
Ruminant Nutrition - N. N.	.50	1.00			
Beef Production - H. Stonaker	1.00	1.00			
+ Hemoparasitology - E. Wells	1.00	1.00			
+ Animal Microbiology - E. Aycardi	.75	1.00			
+ Pathology - G. Morales	.25	1.00			
Helminthology	-				
Soils - J. Spain	1.00	1.00			
Soil Microbiology - N. N.		.75			
Weeds - J. Doll	.50	-			
Total Senior Staff	8.75	10.75			
Scientific and Supervisory Staff	15.30	19.00			

* In addition to the staff shown here, 2 senior staff level and 2 scientific and supervisory staff level people in Animal Health are at CIAT funded through AID and Texas A&M University. This support, which is estimated to cost approximately $ 265,000, will continue in 1975 and 1976.

\+ Shown here are the approximate inputs to Beef of the Animal Health team which in 1975 works on animal health in both Beef and Swine.

Budget Changes

The program Committee of CIAT's Board of Trustees has requested the Director General to undertake a thorough study of the Beef Progam. This study is underway and recommendations regarding geographic and ecological scope of the program, the approach to be followed in the solution of major constraints to livestock production in this region, and the organization, staff and budget projections related to the revised program will be presented to the Executive Committee of the Board in February 1976, and reflected in the 1977 Program and Budget Proposals. In the meantime, senior staff and support increases will be restricted to those resulting from previous decisions and those which the Board considers most likely to be included in a modified program. For this reason, increases in senior staff include only one new senior staff position, a soil microbiologist, the full year effect of the ruminant nutritionist, budgeted for the latter half of 1975. A soil microbiologist is urgently needed to

continue the work previously begun by the soil microbiologist, who was working part time in beef and part time in beans, and now is allocated full time to the bean program. Soil microbiology is an essential component in trying to find means of increasing productivity of pastures on poor soils while minimizing the use of fertilizers.

Pasture weed control input will terminate at the end of 1975, resulting in a decrease of 0.5 M/Y senior scientist input in 1976. The Director-Animal Sciences, previously working 25 % on Swine, will devote full time to Beef in 1976.

The net increase in research associates and assistants is to add one additional research assistant in seed production, one additional research assistant in beef husbandry and two research assistants in animal health, and provide one research associate and one research assistant for soil microbiology. These increases are offset by a reduction of two research assistants in weed control.

Program Commentary

The overall program objective is to contribute to the agricultural and economic development of the lowland tropics through the development of beef cattle based farming systems using grasslands that are not presently suitable for crop production, and using feedstuffs that are not destined for consumption by humans or non-ruminants.

The specific program focus is on the extensive latosol grassland areas (approximately 250,000,000 hectares) in the Llanos of Venezuela and Colombia, Campo Cerrado of Brazil, Beni of Bolivia, as well as similar lands elsewhere. These soils are generally infertile, and many have limited potential for commercial crop production.

CIAT's principal field program is located at the Carimagua station of the Instituto Colombiano Agropecuario in the heart of the Eastern Plains of Colombia frequently referred to in this document as the Llanos Orientales.

Marked increases in cattle productivity have been obtained through the use of improved grass and legume-grass pastures at Carimagua. In the rainy season, weight gains on molasses grass (Melinis minutiflora), a pioneer improved grass, have been four to five times greater than on native grass. However, even higher weight gains of 200kg/ha/yr have been obtained on stylo (Stylosanthes guyanensis) - grass based pastures, as compared to 20 kilograms on native grass. Stylo, a tropical forage legume, is much higher in protein than grasses, is drought resistant, and with soil Rhizobia can symbiotically fix atmospheric nitrogen in the soil. During the dry season, cattle on stylo-based pastures gained weight (310 to 370 gm/head/day) whereas cattle on native and improved grasses lost weight (202 to 610 gm/head/day) .

Supplementation often increases productivity and profit in latosol grass-land areas. Complete mineral supplementation has increased calving percentages of cows grazing native grass by 50-75 per cent (from 58-69 to as high as 103 per cent). All native and improved grasses grown in these latosols, as well as Stylo , are deficient in phosphorous. Protein supplementation during the dry season enabled steers grazing molasses grass pastures to gain weight (10 kilograms) while non-supplemented steers lost weight (55 kilograms) .

Early weaning of calves at 2 1/2 months enabled cows grazing native and molasses grass pastures (on a marginal plane of nutrition) to rebreed. All early weaned calves are healthy and nearly as heavy as nursing calves.

Health status also limits productivity. Survey teams have encountered the breeding diseases brucellosis, leptospirosis and infectious bovine rhinotracheitis in the Llanos Orientales. Incidence of the hemoparasite diseases anaplasmosis and babesiosis has been variable, with anaplasmosis being generally endemic and babesiosis being spotty. In the North Coast, with higher cattle densities, both hemoparasite diseases appear to be highly endemic. Wild animal populations are being checked to determine potential health hazards to man or cattle.

The economists have concentrated on determining the economics of beef production systems in latosol grassland areas. Model simulation studies indicate good returns to low cost inputs that can be applied in the short term, such as mineral supplementation. These studies also indicate that the establisment of improved pastures, a higher cost input, is economically viable, even though temporary negative cash flows are to be expected . Other activities have included a regional workshop on economic aspects of the livestock sector in Latin America, and a bench mark study of the livestock sector in collaboration with national institutions in Perú and Ecuador.

A prototype of a family farm unit has been established to provide data and experience on how to make available technology work for small farmers in areas such as the Llanos Orientales. It included a component to produce food for the farm family and feedstuffs for minor species, and a beef cattle component as the principal commercial part of the enterprise.

Work at CIAT, Palmira, as related to the development of highly intensified systems for small farm units in fertile soil areas indicates that live weight gains of (2500 kg/ ha/yr) can be produced with fertilized and irrigated elephant grass.

A seminar sponsored by CIAT on potentials for increasing beef production in the american tropics was attended by 261 beef production specialists from Latin America and other parts of the world.

CIAT contemplates limited expansion of its operarions at Carimagua. Projects to be initiated or to be expanded in 1975-76 include a) increased attention to seed production of the Stylo legume, b) use of the Stylo legume and non-protein nitrogen supplements to correct protein deficiencies of dry season grasses, c) plant nutrition studies as related to pastures and food crops, d) soil microbiology studies with tropical forage legumes, e) second herd systems project to determine fertility and growth rate of beef cattle in life cycle production systems using native, improved grass and grass-Stylo legume pastures, f) mineral nutrition of cattle, g) animal health investigations relating to the role of ticks as reservoirs and vectors of disease and h) survey of family farms in the Carimagua area by the economics group, with subsequent pilot testing of technology packages with farmers.

In Turipaná, activities in pasture establisment and weed control will be reduced, animal health investigations will continue, and an investigation on milk-beef production in beef cattle herds, initiated in 1975, will be continued into 1976.

Expanded work programmed at the CIAT Center will be principally as related to the Carimagua program, i.e. seed production, plant nutrition, soils microbiology, early weaning of calves and tick investigations.

SWINE PRODUCTION SYSTEMS

Resources

Staff

	Manyears 1975	Manyears 1976	Direct Research Costs $ thousands 1975	Direct Research Costs $ thousands 1976	% Incr.
Animal Science-N.S.Raun (Dir.An.Sc.)	.25		262	233	-11
Nutrition-J.Maner (Leader)	1.00	1.00			
-G. Gómez	1.00	1.00			
+ Animal Microbiology-E. Aycardi	.25	-			
+ Pathology - G. Morales	.75	-			
Total Senior Staff	3.25	2.00			
Scientific and Supervisory Staff	5.00	4.00			

+ Shown here are the approximate inputs to Swine of the Animal Health team which in 1975 works on animal health in both Swine and Beef.

Budget Changes

1975 inputs have been adjusted to reflect the establishment of the Production Economics Unit. For 1976 the sharing of the Director Animal Sciences and the input of Animal Health will be ceased. These changes are in accordance with the change in emphasis of the program described below.

Program Commentary

The future impact of the swine program will depend to a major degree upon the number of trained research and extension workers available to develop and transfer new technology to the farmer for application for more efficient and increased production. If technology advances are to be converted into production increases, each country or region will need scientists with a background and understanding of production-oriented research. The small number of well trained swine production and research scientists available in Latin America for accomplishing this task requires that major emphasis be given to the training of teams of swine specialists to meet this need. Whereas previously primary emphasis has been given to the development of new technology and secondary emphasis to the transfer of this technology, in 1975 and 1976 the emphasis will be reversed. The number of swine production and research trainees will be significantly increased to more rapidly meet the needs of national teaching, research, extension and development institutions working with swine. It is proposed that this be accomplished by the establishment of a new Swine Production Training Course to train swine specialists. The increased training capability will be provided by substantial support from the Training Program and by internal shifts in senior staff time allocations.

The rapid changes that are occurring in the price structure of feedstuffs, swine and swine products and their relationship to other commodities require that up-to-date economic analysis of production systems be made to reflect these changes and to provide information for making decisions related to the application of new and

available technology. Additional economic support also is needed to obtain information on the economic feasibility of swine production and development within countries or regions where the technological feasibility has been established. This increased economic support will be provided by the Production Economics Unit.

The 100 million head of swine in Latin America play a role in the agricultural economy of both small and large farms and provide animal protein for humans. The outlook for improving swine production and thus total availability of pork is based on the knowledge that swine production efficiency is low (extraction rate less than 50 per cent compared with an efficient rate of 160-170 per cent) and that it can be improved significantly through proper and adequate use of available feeds, genetic improvement of existing breeding stock and prevention and control of diseases and parasites. Significant improvements and increases in swine production are possible through increased efficiency and without an increase in the present swine population and to some extent the present level of feedstuffs being utilized.

Program Achievements - 1974

Major emphasis in the program to date has been to develop swine production systems based on the use of available feed resources, giving emphasis to the utilization of food by-products and farm-grown products that because of quality, price or distance to market contribute little to farm income, and on the employment of health and management practices required for efficient production.

A major need has been the replacement of grains with by-products and other feedstuffs that are available and the proper supplementation of these energy sources with adequate protein. Efficient feeding systems have been developed to use cassava, reject bananas, molasses, rice meal and opaque - 2 maize. Long term feeding studies with both cassava meal and opaque -2 maize have demonstrated that the levels of hydrocyanic acid normally found in cassava roots when consumed is rapidly detoxified and excreted as urinary thiocyanate and has little if any effect on either growth or reproductive performance.

Adequate protein supplementation has been accomplished by the use of the commercially available by-products of the oil, fish and meat industries. It has also been shown that cowpeas and soybeans can replace these by-products supplements, but that cull black beans and the majority of the forage legumes offer little promise as major sources of supplemental protein for swine.

The swine population of Latin America is based to a large extent on native breeds whose reproductive and growth performance is lower and less efficient than that of improved breeds produced under adequate conditions of nutrition, health and management. The genetic improvement of these animals is being obtained through a crossbreeding program utilizing presently available , improved breeds. Research results have also been obtained to suggest that it would be possible to select lines of pigs from existing populations that could maintain normal performance at lower than normal dietary protein levels.

The swine health program has shown that foot and mouth disease, diarrhea, arthritis and abortions are the diseases most limiting swine production in the region studied. Concentration on these diseases has made it possible to eliminate completely some of these from

herds and to reduce economic losses.

Twelve post-graduate interns and research scholars and fellows received training in the swine program during 1974. Many of these have returned to their national institutions to fortify existing programs or to initiate new programs as is being done in Bolivia, Costa Rica and Perú.

Future Development

With the development of effective swine production systems based on by-products and available feed resources, during 1975-1976 a major shift in program emphasis will be made. It is recognized that the transfer and application of new technoly development at CIAT and at other institutions will require the training of large teams of swine production and research specialists capable of demonstrating and teaching these new production systems to farmers and of solving local production problems. Major priority will be given to the selection and training of swine production and research teams for countries or regions where the technological and economic feasibility of swine production has been established and where regional and national institutions have given priority and support for development.

The research program will continue to concentrate on the solution of production problems that are shown to limit economic swine production in the regions with production potential that are selected and supported by national institutions. The research program, along with local field studies will serve as training grounds for swine production and research trainees. In addition the program will continue to seek to develop new and innovative production systems that will improve efficiency and economy of production. A prime example of the latter will be the local testing of the cassava fermentor and the evaluation of the fermentation product as a protein source for swine feeding.

Efficiency in technology transfer will require that regions of present and future swine production potential be identified and that priorities, for providing training and technical assistance for national programs involved in the development of this potential be established.

CASSAVA PRODUCTION SYSTEMS

Resources

Staff	Manyears 1975	Manyears 1976	Direct Research Costs $ thousands 1975	Direct Research Costs $ thousands 1976	% Incr.
Physiology-J. Cock (Leader)	1.00	1.00	375	578	54
Breeding - K. Kawano	1.00	1.00			
Pathology - J. Lozano	1.00	1.00			
Entomology - A van Schoonhoven	.87	1.00			
Agronomy/Varietal Improvement-J.Toro	1.00	1.00			
Agronomy/Cultural Practices - N. N.		.75			
Soils - R. Howeler	.50	.50			
Total Senior Staff	5.37	6.25			
Scientific and Supervisory Staff	9.00	12.70			

Budget Changes

An additional agronomist to work on development of production packages and to study the multiple cropping situation is proposed for 1976. This will permit the current agronomist to devote full time to the conduct of yield trials with promising lines in money locations as part of the varietal improvement activities. Increases in scientific and supervisory staff are to support the new senior staff member and to bring the level of support back to where it was before the program decided to use the savings from temporarily deleting these positions to provide additional travel and supplies money in 1975. 17 additional support people at the lower levels are requested. This gives a higher level per senior staff position than in other programs but is justified because of the labor intensiveness of cassava trials and because it will enable research to move faster. Substantial increases in printing of publications are planned for 1976.

Program Commentary

The cassava program has continued work aimed at producing the technology for increasing cassava production and utilization with limited inputs. The ideal plant type for CIAT conditions is now nearly defined and work will concentrate on the adaptability of the ideotype. Control methods for bacteria blight have been developed and proved successful under field conditions whilst some resistance to all major diseases has been found. Similarly varieties resistant to most of the major insects have been encountered. Fortunately, in the case of thrips, resistance is found in potentially high yielding types. The hornworm attacks all varieties and can be devastating, however, biological control measures are being developed. Work in pathology and entomology will continue to develop screening methods, screen new hybrids and where resistance cannot be found develop other control measures.

The methodology of breeding has now been determined and more than 30,000 seedlings are being produced each year. These crosses aim to produce high yielding, disease and insect resistant varieties of high quality that can be harvested easily. Up to 500 promising lines will be placed in replicated yield trials in CIAT and observational yield trials on the acid soils of the tropics and poor sandy soils. From these a small number of elite varieties will be tested under farmers' conditions in fourteen locations in Colombia. The best of these lines will enter an international testing program.

A recent workshop has formed the basis of the international testing network. Representatives from Brazil, Peru, Ecuador, Venezuela, Guatemala, Mexico, India, Indonesia, Malaysia, Thailand and the Philippines defined the modus operandi of the network for genetic exchange and testing. Discussions have also been held with I I T A scientists and officials on means of strengthening cooperation between CIAT and I I T A on Cassava research.

The agronomy section is heavily involved in the germplasm testing and cultural practices are not receiving the attention they warrant. Beginning in 1976 more emphasis will be placed on providing information in the cultural needs of the new varieties. In conjunction with the agronomy section the soils group is developing fertilizer practices and methods of alleviating minor element disorders in the vast areas of allic soils where much cassava is presently grown. Yields of over 20 t / ha have been obtained in these very infertile soils.

Weeds have been shown to depress yield severely, however, control methods either using labour or chemicals have been developed. In the future the entomologist will be responsable for developing integrated crop production technology.

Many of the decisions for resource allocation are based on an agro-economic survey of cassava production being made in Colombia. When completed the economics group will evaluate new technology, study its impact and help define policies which should be followed by national agencies to assist in stabilizing markets.

One of the methods of preventing marked fluctuations in price is to reduce the perishability of a product ; a method of storing cassava in boxes was developed in a joint CIAT/ TPI project. Further cooperation with TPI is planned to formulate simple on farm drying systems. These activities are special project funded.

As the program develops, cooperation between national agencies increases the available information on cassava. The documentation service continues to provide resumes of work on cassava. At the same time the program is developing more intensive training programs to provide people to reinforce national agencies. Last year 20 Brasilians were trained in cassava research methodology.

The development to date is better than had been expected and we believe that the first varieties produced by CIAT will be on a number of farms in various countries within five years, thus contributing to overall cassava production.

BEANS PRODUCTION SYSTEMS

Resources

Staff	Manyears 1975	Manyears 1976	Direct Research Costs $ thousands 1975	Direct Research Costs $ thousands 1976	% Incr.
Soil Microbiology-P. Graham(Leader)	1.00	1.00	408	590	45
Physiology - D. Laing	1.00	1.00			
Breeding - G. Hernandez	1.00	1.00			
- N. N.		1.00			
Pathology - G. Galvez	1.00	1.00			
- N. N.		.50			
Entomology-A. van Schoonhoven	.87	1.00			
Soils - R. Howeler	.50	.50			
Total Senior Staff	5.37	7.00			
Scientific and Supervisory Staff	15.25	15.75			

Budget Commentary

Two additional senior staff positions are proposed- an additional breeder and a pathologist. These expansions, coupled with special funding support for a germplasm scientist and agronomist reflect the acceptance by CIAT of the coordinative functions for a Latin American bean research network, proposed by TAC in 1974. During 1976 collaborative activities, conferences, training courses, collaborative experimentation proposed by TAC, will be special fund supported and so do not appear in this section of the budget. Scientific and supervisory staff are reduced somewhat from previous levels.

Program Commentary

Dry beans are an important component of the human diet in Latin America, nearly 35 % of the world production occurring in this region. Yield levels are low (550-1200 kg/hect), especially among hillside farmers with low credit or technological inputs. The major objective of the CIAT bean program is to increase this yield both for the " campesino " farmer and for those areas of Colombia, Perú, Chile, Brazil, etc. where some technological inputs are available.

Short term yield increases are expected from practices minimalising yield variation. Thus an initial emphasis has been the development and distribution of disease free seed and the recommendations needed for disease and pest control. Using disease free seed, farmers in one area of Guatemala tripled seed yields. ICTA (in collaboration with CIAT) has more than 500 tons of seed now available for distribution. Varietal materials from other countries are also being cleaned. Pesticide recommendations for various regions are almost complete and will be deemphasised in future studies.

The long term improvement in yield will come from varietal improvement and the incorporation of resistance factors into promising materials. The initial step, the evaluation of germplam material, is progressing rapidly. Varieties resistant to web-blight, common mosaic virus, rust, bacterial blight anthracnose and empoasca, have been identified and breeding for both horizontal resistance and for combination of different disease resistances within a single variety are underway. Agronomically promising varieties have also been identified and studied in replicated yield trials over several locations. Yields averaging 3 tons / hect were obtained in Popayan and Ecuador, while individual plot yields topped 4 tons. Climbing beans particularly showed promise with several varieties topping 5 tons / hect and with a maximum yield under high intensity planting of 5.8 tons/hect. Breeding among high yielding varieties is proceeding.

The program hopes to make promising materials available to national programs as soon as possible, and is cataloguing its germplasm data, and maintaining a data information retrieval system. Rust resistance nurseries and international yield trials, to be initiated in 1975-76 will promote germplasm transfer.

In response to the TAC request, the program has initiated some of the activities required by a collaborative bean research network. Specific activities have included :

a) A workshop to review the bean program and the relevance of its research in relation to Latin American problems was held in October 1974. A technical committee in which the majority of members are Latin American scientists has been elected to advise and review the program. Additional information on research needs and priorities will come from agroeconomic surveys currenily underway in Colombia but to be extended in 1975-76 to two other countries.

b) A rust resistance Workshop considered rust symptomatology, and devised standard methods for screening material for rust resistance; 108 varieties are included in the original rust nursery.

c) A documentation service has been initiated with cards forwarded to 200 scientists in 29 countries. More than 1000 articles have been abstracted to date.

d) Collaborative experiments are underway in four countries and are to study CIAT developed technology for relevance to particular ecological conditions.

e) A program document has been prepared and will be distributed to national programs as a guide to the functions and services CIAT can offer. Close contact between CIAT and national programs especially in the training area, will need to be an essential part of the research network activities.

RICE PRODUCTION SYSTEMS

Resources

Staff	Manyears 1975	Manyears 1976	Direct Research Costs $ thousands 1975	Direct Research Costs $ thousands 1976	% Incr.
Breeding - P. Jennings (Leader)	1.00	1.00	223	IRRI Budget	
Agronomy- R. Cheaney	1.00	1.00			
Agricultural Engineering-L. Johnson	1.00	1.00			
Total Senior Staff	3.00	3.00			
Scientific and Supervisory Staff	1.50	2.00			

Budget Changes

The Directors of IRRI and CIAT have agreed that the rice production systems program at CIAT will be considered an integral part of the international program of IRRI and the regional responsabilities of CIAT. The senior staff of this program will be considered as full members of the personnel of both centers. The direct costs of the program will be part of the IRRI budget with the indirect costs to be met by CIAT. In order to strengthen the ability of the IRRI-CIAT rice production systems program to provide a technical backstopping for national rice research and develpment activities, as discussed in future plans and prospects below, the agricultural engineer (presently on sabbatical leave) originally assigned to the small farm systems program and development of ICA's Turipaná station in the 1975 budget, has been assigned full time (when he returns in July 1975) to this program.

Program Commentary

Progress to Date

The CIAT rice breeder and agronomist, cooperating closely with the Colombian ICA rice program, have successfully modified and developed new technology for traditional tropical American conditions. Large quantities of seed of four new dwarf varieties have been released internationally, including IR8 and IR22 from Asia and CICA 4 and CICA 6 developed in Palmira.

Massive training of personnel of national programs from essentially all countries in the hemisphere has given the necessary linkages to farmers. Farmer acceptance of the new technology and resultant increases in production have been spectacular. Data from Colombia indicate : 98 percent adoption of new varieties in the irrigated sector , an increase of 2.4 tons per hectare to 5.4 T /ha, a marked area increase in the irrigated sector with a corresponding decrease in upland area, and an approximate doubling of national production since the program began. Similar gains have occurred in Peru, Ecuador, Venezuela, Cuba, Mexico and portions of Central America.

Small varietal trials and some experience in countries that have not adopted the new technology including Guyana, Paraguay, Argentina, and Brazil, indicate substantial yield advantage of the new varieties over local materials.

Future Plans and Prospects

The countries that have widely adopted the new technology will soon experience difficulty in achieving additional increases in productivity because : a) the area of adoption already is large and b) average yields are extremely high.

Modest gains might be expected through the release of blast resistant varieties and through improvement in weed control. These are paramount program objectives at present.

Massive increases in productivity are possible in the traditional rice areas of the countries which have not adopted the new technology. It is considered that stagnancy in productivity in these countries is not due to inadequate technology. Rather, the solution appears to lie in training, demonstration, and stimulation of local rice workers. To this end a second agronomist has been projected for 1977 in effect to bring semi-tropical Latin America to the level of productivity now experienced in northen South America through Mexico.

Perhaps the most attractive opportunity for increased rice production in the Americas is the exploitation of the enormous idle land and water resources in the humid tropics. Modified Asian technology developed at CIAT is the key to opening these areas to rice culture. This new technology, requires further modification but has been proved on large scale commercial plantings. To polish the new modified Asian system and to prepare for country production programs tied to CIAT and IRRI, the CIAT Agricultural engineer was assigned full time to the rice team in 1975.

MAIZE PRODUCTION SYSTEMS

Resources

Staff	Manyears 1975	Manyears 1976	Direct Research Costs $ thousands 1975	Direct Research Costs $ thousands 1976	% Incr.
Breeding - S. Temple	1.00	1.00	90	CIMMYT Budget	
Maize Scientist - N. N.		1.00			
Maize Scientist - N. N.		1.00			
Total Senior Staff	1.00	3.00			
Scientific & Supervisory Staff	4.00	1.00			

Budget Changes

The Directors of CIMMYT and CIAT have agreed that the direct costs of the maize activities, formerly covered under the CIAT maize program, will become part of the CIMMYT budget. The number of senior staff will be expanded from one to three, in order to meet the program objectives described below. Supporting staff will be reduced since most of the research activities will be conducted within national programs.

Program Commentary

The joint CIMMYT-CIAT activities aimed to increasing maize yields in the Andean region and northern Brazil will be conducted in accord with the following principles :

1) That maximum emphasis is placed upon strengthening national programs and their staffs ; that research to benefit the Andean region should be conducted as far as possible, on a collaborative basis, within national programs, and that local scientists be asked to share in the planning and execution of regional services.

2) That services provided by CIMMYT-CIAT should pool the strong points of the two centers -- particularly CIAT's regional emphasis and CIMMYT's global leadership on maize.

3) That CIMMYT and CIAT use these joint Andean services as a demonstration of inter-center relations, in order to establish a pattern of cooperation for wider application to other crops, and other areas.

The activities of this program will be as follows :

1) A CIMMYT-CIAT team of two maize scientists will be stationed at the CIAT headquarters, and devote full-time to services which will strengthen national maize programs of the Andean region, including:

- Consulting with national programs regarding their production problems and their research and extension programs for the maize crop.

- Helping plan and carry out training programs with the staffs of national maize programs, including the promotion of a workshop among maize workers of the region, annually or every two years.

- Coordinating development of uniform nursery trials and analizing the data, if necessary.

- Promoting the participation of Andean scientists in the above activities, including arrangements for mutual consultation among national programs' personnel.

- Producing a regular information document summarizing maize research in the region, emphasizing the collaboration between the CIMMYT-CIAT team and national programs.

2) A CIMMYT-CIAT maize breeder will be stationed in one of the four Andean countries which produce highland floury maize, to devote full-time to breeding and outreach work on floury maize.

3) Training in maize production research will be divided among CIMMYT, CIAT, and national programs in order to take full advantage of all available resources, including:

- Researchers in maize will receive in-service training at CIMMYT in order to benefit from the multi-disciplined research program for both lowland and highland crops.

- Both CIMMYT and CIAT will participate in the training of production agronomists, with emphasis on training within national programs.

SMALL FARM SYSTEMS

Resources

* Staff

	Manyears 1975	Manyears 1976	Direct Research Costs $ thousands 1975	Direct Research Costs $ thousands 1976	% Incr.
Agronomy - C. Francis (Leader)	1.00	1.00	175	211	21
Systems Engineering-D.Franklin	.50	-			
Protection Agronomy - J. Doll	.50	1.00			
Total Senior Staff	2.00	2.00			
Scientific and Supervisory Staff	7.00	7.00			

* In addition to the staff shown, a Sociologist funded through FAO, is working in this program in 1975 and will continue in 1976.

Budget Changes

The systems engineer has up to now been dividing his time between this program and Biometrics. From 1976 he will be full time in Biometrics and will provide the necessary systems engineering input to this program as a service in the same way as Biometrics services other programs.

The protection agronomist, previously working half time in this program and in Beef, will be full time in this program as from 1976.

Program Commentary

The CIAT Small Farm Systems Program is directed toward the complex challenge of increasing production and income, as well as improving nutrition, on the small farm in the lowland tropics. In order to select or design appropriate technology for the small farmer, it is necessary to understand his objectives and needs, the farm level and external constraints within which he operates, and the way he integrates crop and animal production alternatives in his current production system. Technology has been developed and is available for some tropical crops, but the adoption of improved varieties and more productive practices has been concentrated in the small, highly commercialized farming sector. On a large number of small farms, productivity has changed little as a result of agricultural research and development efforts. This latter group, the small farmers in Latin America, produces a major portion

of the basic food crops : maize, beans, wheat, potatoes, cassava and plantain. This important group and its contribution to national production has been relatively untouched by technology, and productivity unaffected by the " green revolution " .

Much technology is available, some elements of which are adaptable to small farm agriculture. A specific objective of the Small Farm Systems Program is the selection, design, and combination of appropriate technology for testing and demonstration on small farms in specific ecological regions in Latin America. This includes the development and testing of viable alternatives for the family, in terms of what to produce and decisions to sell or consume plant and animal products, and to enable the family to take advantage of favorable markets, reduce risks, improve nutrition and accumulate capital.

Small farm systems are complex, and many of the problems and technological solutions are unique to each micro-environment, and the specific ecology and political situation in each zone . Although there is a strong need for improved and appropriate species and management practices in the small farm production system, many factors external to the farm are also central to production and success. Government policies and strategies with respect to costs and availability of inputs, credit, marketing, price supports, and land tenure also affect the small farmer's decisions and success as a producer. Relevant alternatives must be realistic within this complex political, cultural and natural environment of the small farmer.

Activities during 1974 have led to a better understanding of several farming systems, to a more specific focus for activities in 1975, and to long range plans for 1976 and subsequent years .

Focus on Lowland Tropics

The majority of small farmers in Latin America live in the highlands, where limited land and lack of infrastructure are among the factors which lead to rural poverty. Agriculture in the highlands has evolved over long periods of time on relatively fertile soils, and current systems are operating near potential. In many zones, agriculture provides only a minor part of total income, and the probability of increasing family income and national production through introduction of new agricultural technology is low.

The potential for increasing small farm production and income in the lowland tropics arises from temperatures which allow two or more crops per year, where moisture is available, and the vegetative cycle of most basic food crops is shorter. Production-limiting factors such as less fertile soils, insect, disease and weed problems, and lack of water control, can be solved through development and application of appropriate technology. Many new lands being brought into production are in lowland regions, where total national food production and economic development are expected from introducing appropriate technology which makes land and labor more productive.

Focus on Critical Issues

The experience of the past year has led to a focus on several critical issues which are central to increasing production on the small farm, and appropriate for research by the Small Farm Systems Team . These include production-oriented questions which relate to

multiple cropping, choices among alternative inputs when capital is limited, efficiency of legume-based N in cereal-legume intercrop systems, integrated animal schemes based on crop residues, weed control in basic food crops, pest control in subsistence cropping systems, and use of appropriate mechanization on the small farm.

Relevant economic issues include quantifying subsistence production, the importance of risk on decision making, the optimum combination of production enterprises for the small farmer, and the role of national agencies in moving technology and increasing production. Social issues include the structure and size of the farm family, and their use of time, as factors which influence agricultural output, as well as the role of farmer organizations in successful adoption of agricultural technology. A quantitative system for evaluation of technology is being developed using techniques of systems analysis.

Focus on Production Zones

Information on those issues critical to production on small farms in the lowland tropics is a result of direct work with farmers and government agencies in production zones. Solutions to specific production problems are only relevant and useful when appropriate technological alternatives are tested and demonstrated for adoption within each zone, where the impact of research and technology can be measured in terms of family farm production and income. Not only can the appropriate farm level technology be tested, but the zone can be used by governments to test alternative policies on input supplies, price supports, credit levels and availability. Each pilot zone also provides a site for training research and development personnel to multiply the application of this process across other zones in each country, and across a region.

This emphasis on production zones illustrates a critical and long term direction of the Systems Program. The team is concerned and involved with development of strategies which governments can use to efficiently assess production-limiting problems, test and demonstrate alternative production technologies on the farm, and evaluate the impact of these programs. Specific research projects of the CIAT program are a part of this strategy. Collaboration with CIAT commodity programs in the application of specific research results and with the training and communications program in preparing research and development personnel to use this problem-solving process are integral to the Small Farm Systems Program plans and activities. To meet this long-term objective, the team is directly involved in outreach activities in specific countries of the lowland tropics of Latin America.

* PRODUCTION ECONOMICS UNIT

Resources

Staff	Manyears 1975	Manyears 1976	Direct Research Costs $ thousands 1975	Direct Research Costs $ thousands 1976	% Incr.
Economists - P.P.Andersen (Leader)	1.00	1.00	264	318	20
- G. Scobie	1.00	1.00			
- A. Valdés	1.00	1.00			
Total Senior Staff	3.00	3.00			
Scientific and Supervisory Staff	10.50	12.00			

Budget Changes

No increases in staffing levels are proposed

Program Commentary

Up until February, 1975 when the economics unit was established, economics research was structured and budgeted within the commodity programs.

Past and on-going work emphasizes economic analysis of the production processes for cassava, beans, maize, swine and beef cattle for the primary purpose of identifying factors limiting productivity and evaluating the potential benefits from removing these factors. Other work completed and in progress include economic analyses of agricultural research results and specific technologies.

Agro-economic analyses of the cassava and bean production process in Colombia are planned to be completed in the beginning of 1976 and assistance to other countries for similar studies is presently being provided or planned. Economic analyses of selected mixed cropping systems are in progress and expected to be completed toward the end of 1975. A collaborative research program on the economic aspects of the livestock industry in Latin America has been established and projects are underway in a number of countries. Other on-going work on livestock includes an economic analysis of beef production systems in savanna regions and some preliminary analyses of the economic losses caused by selected animal diseases, with emphasis on foot and mouth disease.

An analysis of the implications of the recent rapid adoption of high yielding rice varieties in Colombia was recently initiated. Other on-going and planned projects include the development and testing of a methodology for estimating the relative impact of alternative research activities on human nutrition.

As CIAT agricultural research progresses and more new technology becomes available, the economics unit will place more emphasis on analyses of the performance of such technology at the farm level as well as studies aimed at promoting its diffusion and adoption with some attention to relevant public policy issues.

* This unit was created following acceptance by the Executive Committe of certain of the Director General's recommendations for CIAT's organization.

TRAINING AND CONFERENCES

Resources

Staff	Manyears 1975	Manyears 1976	Direct Costs $ thousands 1975	Direct Costs $ thousands 1976	Direct Costs % Incr.
Communication Science-F.Byrnes (Director)	1.00	1.00	585	750	28
Training Coordination-C. Moore	1.00	1.00			
-F.Fernandez	1.00	1.00			
Total Senior Staff	3.00	3.00			
Scientific and Supervisory Staff	7.50	9.50			

Budget Changes

The Editorial Services Unit was previously included with this group. It has now been separated and included in Library and Information Services .

Two additional scientific and supervisory level posts are requested for 1976 to provide an extra 2.0 manyears. Of these, one is for a training associate for communication science and one for an additional interpreter .

Experience has indicated there are greater availabilities of special project funds to finance some aspects of training than others. Of 160 trainees at CIAT in 1974, only 62 were financed from CIAT core funds. Further, the value of certain kinds of training, such as post doctoral, has been demonstrated by some of the other centers as well as by CIAT's limited experience in this area. Consequently, the 1976 budget is being increased to provide 2.5 manyears of post doctorals, and the stipends for post graduate interns reduced to provide limited funds to finance certain production specialist trainees who can not be funded in the present on-going special projects.

Demands are increasing for various training activities organized around a single commodity and, in some cases special techniques within a commodity. This has led to an increase in the funds requested in Conferences and Symposia to cover travel and per diem of short course participants and some increases in supplies and services throughout Training and Conferences .

Program Commentary

General

Facilities and available staff time impose definite restrictions on the overall operations in Training and Conferences. The present capacity for housing trainees at CIAT is 80, while

the conference housing maximum is 64. While larger conference groups can be handled by booking rooms in Cali, available air-conditioned facilities limit groups to a maximum of 200.

Scientists in the commodity programs must budget their time between research, training, conference participation, and travel and consultation in other countries. As more trainees complete programs at CIAT, the need increases to provide followup support in the countries. Successful establishment and continuance of in-country training efforts depends on CIAT's abilities to supply temporary instructors and increased amounts of training materials. Growing emphasis on socio-economic issues involving CIAT commodities emphasizes the need for greater inputs from this area into the training programs.

Finally, a pace-setter for training and conference activities in the future are the developing of outreach programs, and every effort is being made to maintain flexibility so as to be able to respond in this area effectively and promptly.

Training for Research and Production

Training activities at CIAT provide learning experiences for professionals, some to conduct production-oriented research in their own organizations, while larger numbers become crop or animal production specialists, helping to translate and communicate new agricultural technology.

Of immediate concern is the preparation of individuals to accelerate research on and the application of new technology in their own countries. These trainees help CIAT to develop effective links for the exchange of knowledge about agricultural problems and their solution, and eventually, to build and strengthen effective networks for research and communication among scientists.

The longer-term goals are to increase the numbers of research workers, educators, and extension specialists with competency to identify and solve production problems and the ability to communicate these solutions to farmers and others. CIAT's continuing training role is to provide counsel and assistance where appropriate, to train cadres of individuals to staff existing and new training operations within countries, to offer opportunities for specialized or refresher training for selected individuals, and to help the various institutions develop more adequate resources of teaching and reference materials.

During 1974, 160 persons from 22 countries were enrolled, including 43 as post-graduate interns in research, 62 as production specialists, 19 as master degree students, 15 working on doctoral dissertations, and 21 special, short-term trainees.

Performance of CIAT trainees after return to their own countries and work organizations and growing awareness of CIAT throughout the world has influenced significantly the growth of the training program, the kinds of persons applying for training, and availability of support for trainees. Of the 160 persons enrolled in 1974, only 62 were supported by CIAT funds directly. Other principal sources of support were the Interamerican Development Bank, 25, and national interests of various countries, 36. More than 1,600 persons from many countries participated in some 25 international and national conferences, symposia, workshops and short courses.

Plans provide for training of the following categories of persons in 1976 :

Post-Doctoral Fellows . CIAT established this category in 1975 with the objective of providing high level, advanced research experience in tropical agriculture for young scientists interested in careers in the tropics. Such a program, as other centers already have demonstrated, become the principal sources of experienced staff for outreach projects or to undertake major research programs in countries. CIAT expects to identify other sources of funds so as to increase the numbers in this category, but for 1976 is budgeting $ 74,000 which is expected to cover 3 1/2 man years of such training.

Post-Graduate Interns. These are young scientists, chiefly from Latin America and the Caribbean, who have completed undergraduate degrees in agronomy, animal science, or veterinary medicine. They receive on-the-job training in production system studies while serving as full-time research interns. Thirty-two man years of these interns are funded in the budget for 1976, at an average of $ 4,000 each.

Production Specialists. CIAT presently is involved in the eighth and ninth courses designed to prepare agricultural production specialists for developing countries. Each year CIAT offers one course in Livestock production, the other in crop production, depending upon demand and available funding. Costs of these courses have been supported, in the past, on a special project basis by the Interamerican Development Bank and other organizations.

The objective of these courses is to produce specialists with the scientific, technical, economic, farming and communication competencies necessary to diagnose production problems of a livestock enterprise, or a crop farm, prepared to work in the field as individuals or, more importantly, to establish and conduct training programs in their own countries.

While special project funding is contemplated for the bulk of the production specialist training in 1976, funds to cover up to 4 man years of such training ($ 16,000) are included to cover enrollment of individuals who cannot be covered under the special project funding terms.

Research Scholars and Fellows . Allocations for these people will in future be used only for : a) continuation of scholars and fellows already enrolled; b) some scholarships for scholars and fellows to cover the research portion of their M.Sc. or Ph.D studies at CIAT; and c) in certain cases, scholarships for the course work portion of a scholar of fellow who will do his research at CIAT.

Other Trainees. CIAT maintains a flexible policy to provide unique training opportunities for young professionals from many lands. For example, through an agreement with Wageningen University in the Netherlands, fourth year animal science students come to CIAT for up to a year on-the-job experience in the management of animals and pastures under tropical conditions. A similar program has been initiated with Wageningen for students interested in rural sociological problems in the tropics.

Through informal arrangements with various universities, other graduate students may spend extended periods of time with CIAT working under the supervision of CIAT senior staff

and on problems of direct interest to CIAT. CIAT limits its financial involvement to helping, where necessary, with the direct research expense.

Conferences and Symposia

CIAT facilities for conferences and symposia include an organizational staff, meeting rooms, equipment , housing, and feeding. Activities contemplated for 1976 and beyond include policy seminars for national leaders, scientific symposia and technical workshops for research workers, short courses for production specialists, and such other events as may be appropriate for representatives of various entities in the total agricultural development system.

The core budget includes funds to cover the staffing and operations of a small conference management and support staff. The staffing pattern for 1976 includes two professional simultaneous interpreters who between conferences translate manuscripts for conference papers, publications, and other materials.

In 1973, the Board indicated the desirability of putting more stability and predictability into the financial structure for conferences and symposia by providing core funds to support a limited number of scheduled events considered by the commodity program teams as instrumental to achieving the success of the respective commodity programs.

The amount included for Core Support in 1976 is $ 156,000 plus the salaries of the staff. This is minimal considering that CIAT has six commodity programs plus the Small Farm Systems Research program. This amount, in addition, provides up to $ 60,000 to finance the equivalent of three commodity or disciplinary short courses of 30 days each.

LIBRARY AND INFORMATION SERVICES

Resources

Staff	Manyears 1975	Manyears 1976	Direct Research Costs $ thousands 1975	Direct Research Costs $ thousands 1976	% Incr.
Librarian-F. Monge (Leader)	1.00	1.00	434	513	18
Editors - M. Gutierrez	1.00	1.00			
- C. Bower	.83	1.00			
Photographer - N. Mc.Lellan	1.00	-			
Total Senior Staff	3.83	3.00			
Scientific and Supervisory Staff	11.58	13.75			

Budget Changes

The position for a photographer will be discontinued in 1976 when the photographic laboratory will be well established. An additional research associate is requested to help with the increasing workload for documentation activities. Three other support staff are also requested to handle the new machinery that will be arriving in 1975 and 1976.

Program Commentary

The Library has a collection of about 30,000 books and subscribes to about 1200 journals. Besides the regular function of a specialized library, CIAT's library operates a documentation center for cassava, field beans, agricultural economics and animal health, some of which is supported by special funds from Ford Foundation and IDRC. It also provides a current awareness service of journals' tables of contents.

Information Services includes editors in English and Spanish and a print shop to handle in house most of the editing and printing of an ever increasing workload.

RESEARCH SUPPORT GROUPS

LABORATORY SERVICES

Resources

Staff	Manyears		Direct Costs $ thousands		%
	1975	1976	1975	1976	Incr.
Scientific and Supervisory Staff	1.00	1.00	45	55	22

Program and Budget Commentary

This unit groups together certain central laboratory services for most programs. Included are a laboratory equipment maintenance engineer, nutritional and soils analysis personnel and a small animal colony. The increased budget reflects the addition of two support staff and other expenses to enable the unit to handle the analytical demands of programs.

BIOMETRICS

Resources

Staff	Manyears		Direct Costs $ thousands		%
	1975	1976	1975	1976	Incr.
Biometrician - D. Franklin	.50	1.00	88	161	83
Scientific and Supervisory Staff	4.00	5.00			

Budget Changes

It is proposed that the biometrician, presently working only half-time in this unit, will be full-time in 1976. This will enable the unit to satisfy the increasing demands for services.

A rented data processing terminal linked to a computer in Bogotá will be installed shortly which will increase costs by about $ 20,000 over those in 1976. This will produce a quantum jump in data processing capability which will require some additional support at the scientific and supervisory and lower levels.

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, Beef).

4. Consultation on survey design and execution and storage, retrieval and analysis of producer survey data (Cassava, Small Farm, 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 (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 accomplished through " desk-top computers " available within 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 for research in agriculture and economics in the United States. Access to large scale computation is achieved through the collaborative program with the Instituto Colombiano Agropecuario , whereby CIAT obtains the capability of processing on the IBM 370-145 computer belonging to the National Administrative Department of Statistics (D.A.N.E.) an agency of the Colombian Government. Demand for the use of large scale computing services has increased markedly in the last year. It has now become inefficient and time consuming to process data in Bogotá by use of courriers and the mails. In considering alternatives to satisfy this demand for computer services, the use of an in-house computer has been ruled out, because the size computer required will be too large. Rather it is comtemplated that adequate level of services can be obtained by connecting a data communication terminal located at CIAT to the DANE computer over standard telephone lines.

STATION OPERATIONS

Resources

Staff	Manyears 1975	Manyears 1976	Direct Costs $ thousands 1975	Direct Costs $ thousands 1976	% Incr.
Farm Superintendent	-	1.00	179	208	16
Scientific and Supervisory Staff	3.00	2.00			

Budget Changes

The Executive Committe of the Board of Trustees approved proposal to upgrade the position of Farm Superintendent to the senior staff level. Provision for this is made in the 1976 staffing shown. Early in 1975 a labor pool of 30 men was formed to handle some of the peak demands of programs and general maintenance. Previously this work was handled by specially contracted temporary labor.

Program Commentary

CIAT operates a farm at Palmira of approximately 520 hectares. 20 ha. are cultivated without being levelled, 300 h. levelled for irrigation and leached of excess salts, 36 ha. developed and fenced for grazing trials and 100 ha. put to commercial pastures. Buildings and grounds around buildings cover 36 ha. Station Operations operates and maintains 35 Kms. of all weather roads, 43 Kms. of drains, 35.5 Kms. of fence, 22.5 Kms. of irrigation canals and 10 Kms. of concrete and soil-cement lined canals.

Station Operations supports all CIAT's programs, maintains and operates a tractor pool, and manges a labor pool , which has been established in 1975. The areas that are not utilized by the programs are kept clean, producing commercial crops which produce income in excess of $ 100,000 per annum.

ADMINISTRATION

Resources

Staff

	Manyears 1975	Manyears 1976	Direct Costs $ thousands 1975	Direct Costs $ thousands 1976	% Incr.
Director General - J.L. Nickel	1.00	1.00	629	902	43
Associate Director General - E. Alvarez	1.00	1.00			
Associate Director General - N.N.	.50	1.00			
Executive Officer - J. A. Cuellar	.87	1.00			
Controller - A. V. Urquhart	1.00	1.00			
Total Senior Staff	4.37	5.00			
Scientific & Supervisory Staff	12.42	15.25			

Budget Changes

The position for Director - Plant Sciences, which was vacant for all of 1974 has been changed to Associate Director General following approval of reorganization proposals by the Executive Committee . It is assumed it will be filled in mid 1975.

Included for the first time in 1976 are $30,000 for the support of visiting scientists and $10,000 for the support before and between assignments of outreach contract staff.

Increases in scientific and supervisory staff are for an analyst for the Controller's office to assist in the installation of a rented accounting machine for which about $12,000 is included in 1976. Two additional administrative posts are included for the Executive Officer, one to assist in space planning and property control and the other to give administrative support in Carimagua.

Program Commentary

Administration consists of the Office of the Director General, the Controller and the Office of the Executive Officer. The Office of the Director General includes three senior staff, the Director General and the Associate Directors General. These officers are responsible for overall management of the Center. The Controller, a senior staff officer reporting directly to the Director General, is responsible for budget preparation and budget management, accounting, internal audit, financial reports and certain senior staff personnel matters. The fourth senior administrative officer is the Executive Officer. His responsibilities are purchasing, travel, food and housing, storerooms and inventory, security, reception services, and junior staff personnel matters. In addition, the superintendent of Physical Plant and Motor Pool reports to the Executive Officer.

GENERAL OPERATING COSTS

PHYSICAL PLANT

Resources

Staff	Manyears		Direct Costs $ thousands		%
	1975	1976	1975	1976	Incr.
Scientific and Supervisory Staff	2.00	2.00	366	457	25

Budget Changes

Support staff increased substantially early in 1975 when approximately 25 personnel previously employed through an agency were included as regular employees. For 1976 an additional 12 support staff are requested to enable the unit to satisfy the maintenance cleaning and gardening requirements which have increased because the buildings are no longer new, the airconditioning system is no longer under guarantee and to service new areas. Two additional security people are requested to patrol new buildings.

Program Commentary

The Palmira installations consist of 8 main buildings, including laboratories, plus 76 living units on 45,000 square meters of maintained grounds. The gross area of buildings is 22,000 square meters, of which 70 percent is air-conditioned.

Other than electricity for which only an emergency generator is maintained, CIAT provides all its own services. Physical Plant includes resources to run and maintain these services, maintain all buildings and grounds and a security force of 33 people. The unit is also responsible for contracting and supervising minor alterations and construction jobs.

MOTOR POOL

Resources

Staff			Direct Costs $ thousands		%
	1975	1976	1975	1976	Incr.
Scientific and Supervisory Staff	-	-	144	196	36

Budget Changes

An additional 5 support staff are requested to provide drivers for an additional bus which will arrive by 1976 and get better use out of the vehicle fleet ; to service small gasoline motors and motorbikes ; and to add an electrician.

The original 1975 budget provided for a doubling of the price of gasoline. It is estimated that this will not now happen until 1976. The 1975 budget was revised downward accordingly and $ 25,000 of the increase in 1976 is to make provision for this one factor.

Program Commentary

CIAT operates a fleet of about 140 vehicles. This includes buses, trucks, vans, pickups, jeeps, station wagons, passenger cars and motorcycles. These vehicles are from various manufacturers.

The workshop performs every type of service on vehicles from supply of gasoline, to preventive maintenance, body repairs and major mechanical repairs. In addition, the Motor Pool provides drivers and vehicles when needed and monitors a rented bus service for the transport of employees from Cali and Palmira.

GENERAL EXPENSES

Included in this category are office supplies, electricity, boiler fuel, telephone cost, telex and cable costs, postage, insurance, etc. The budget for these is $ 343,000 for 1976 as compared with $ 283,000 in 1975 - an 21 % increase.

CAPITAL REQUIREMENTS

During the last two months a special committee, appointed by the Director General, has studied probable space requirements for projected staffing levels in 1980 and needs for accommodating increases between now and then. Equipment and other specialized needs of programs for 1976 have also been reviewed. The following table sets out estimated requirements for capital funds for the years 1976 to 1980.

	Square metres	1976	1977	1978	1979	1980
Warehouse	2000	$ 242,000				
Office building	800	100,000	$ 61,000			
Station Operations building	3000	100,000	167,000		$ 305,000	
Extension of library & information services building	600		117,000			
Airconditioned greenhouse	500	50,000				
Greenhouse	720		47,000			
Greenhouse / screenhouse service facilities	400	40,000				
Telephone switchboard		115,000		$ 35,000		
Microwave telephone channels		80,000				
Additional emergency generator		100,000				
Apartment building	290		56,000			
Building modifications		50,000	50,000	50,000		
Modifications to amphitheatre		25,000				
Soil improvement program		25,000	25,000			
Asphalt treatment for service roads		35,000				
Equipment etc.		472,000	320,000	321,000	322,000	$ 141,000
		$ 1,434,000	$ 843,000	$ 406,000	$ 627,000	$ 141,000

At the time of writing, three of CIAT's seven core programs are under review so certain broad assumptions have had to be made as to the distribution among programs of projected staff. It is estimated that CIAT will have a core senior staff of 71 by 1980 (including Rice and Maize) and that there will be another 20 persons at the senior staff level as visiting scientists, post-doctoral fellows, and special project personnel.

We have concluded that today's needs are, and those of the future will be, for more service areas and more offices. Laboratory space will be sufficient through 1980 provided much of that area currently being used for offices can be used as laboratory space, with those needing offices being moved elsewhere. Similarly, a certain amount of additional service area or station operations space can be obtained by moving out the warehouse which occupies part of the present station operations building. However, this will only give about 600 square metres additional space while it is estimated that a total of 2000 square metres are needed now and further 1500 metres later. It is therefore proposed that a similar building to the present station operation building be constructed to give an additional 3,000 square metres. This would be built in two stages to provide space when required.

Nearly all the original farm building at El Porvenir, previously used as offices, etc., while the center was being built, are now being used as warehouse space. Most of these buildings are now dilapidated and also not suitable, because of distance and convenience, for use as warehouse space. We propose demolishing these buildings and building a separate warehouse building suitable for storing all CIAT's stocks of supplies and spare parts.

The Library now has a total of about 31,000 books and it is estimated that it should continue to grow at about 5,000 books per annum. Existing space gives capacity for 38,000 books and will therefore be nearly full by the end of 1976, so additional space will be needed. Two large conference rooms were converted to offices to provide space for the training and social sciences staffs and the travel office. Conference rooms are adequate for current demand but, with likely increases in training courses and conferences, additional space would be desirable. Relocating the personnel using the converted conference rooms would provide this. It is therefore proposed that the existing library and information services building be extended eastwards to provide additional library space on the second floor and training offices on the first floor.

An additional office building is proposed which would accommodate staff presently using laboratory space as offices, the social sciences staff, small farm systems staff and biometrics. This building could be located at the back of the present administration building so as to be fairly central. Biometrics space in the administration building would be used to house the travel office, the mail room and provide some space for the expansion of the purchasing and controller's sections.

Construction of a second greenhouse financed in the 1974 capital budget will start shortly. The bean program needs an airconditioned greenhouse for its work on station on high altitude beans. It is proposed that this and additional service facilities for the greenhouses and screenhouses be built in 1976. An additional greenhouse mainly to serve the increasing needs of the bean and cassava programs is requested for 1977.

As mentioned earlier, the beef, swine and small farm systems programs are under review. It is not anticipated that any decisions on the latter two programs will materially alter space requirements, however, decisions on the beef program will. It is thought likely that the beef program will be decentralized with a nucleus staff of about five at headquarters and the rest of the staff located in groups of two to five in various tropical locations. It is hoped that these people would work in collaboration with and on the stations of national institutions. Capital requirements would depend on facilities available and support given but should not exceed about $ 200,000 per location. For purposes of these projections we have included $ 200,000 in each of the years 1977 to 1979 but it should be stressed that these are mere estimates and that more meaningful figures will have to await the outcome of the review of the beef program and decisions to be taken next year for the 1977 budget.

Improvements in certain services will be needed to cover the proposed new construction. We understand that our central air-conditioning plant is adequate to handle the new buildings which will be airconditioned i.e. the office building and the extension of the library and information services building. However, the telephone system and the emergency generation plant are both already inadequate. We propose improvements in 1976 which will bring service to a satisfactory level and provide for most of the additions described above.

CIAT has a switchboard for 180 internal lines and has 20 local lines to Palmira. Neither of these is adequate. We propose replacing the present switchboard with one of 400 lines. This will enable us to connect up our housing units, which now have no service, and provide lines for the new buildings. Nearly all calls from and to CIAT are with Cali but since there are only 65 lines from Palmira to Cali, it is extremely difficult to get through. We propose adding a microwave system with 12 channels which will enable us to connect straight into the Cali exchange with a consequent improvement in service, a reduction in telephone charges, and savings on clerical time trying to get an open line.

Improvements are required in the emergency power supply system; first to connect the machinery which needs power all the time to the system ; and second to provide sufficient capacity to supply the needed power. It is therefore proposed that a second generator, similar to the present one, be added to give a total of 640 KW. This compares with estimated total demand of 580 KW.

The improvement and additions described above are what we estimate will be required by 1980. However a certain amount of additional space will be needed shortly, with requirements building up to 1980. Phasing of these additions is therefore important. We propose that the warehouse and the office building be started as soon as possible. These would release space in the station operations building and provide offices and laboratory space for the increased staff. These buildings would be started in mid 1976 with the warehouse being completed by the end of the year and the office building early in 1977. Towards the end of 1976 one half of the new station operations

building should be started with completion by mid 1977. This would give the additional work space which will be needed by then. The other half should be built in 1979 to cover new requirements. The extension to the library and information services building should be started in mid 1977 with completion early in 1978. An increase of another 100 lines in the switchboard will probably be needed in 1978.

So far no mention has been made of plans for spending money granted in the 1975 capital budget for a house for the food and housing manager and the eating and changing facilities for workers. We propose going ahead with these this year. The house will release one of the four apartments presently occupied by the food and housing manager. Apartments should then be sufficient for the next two years. We propose that two more apartment units be built in 1977.

Before and as new buildings came on stream many modifications will have to be made in existing buildings to accommodate staff and as they are moved from one area to another. Provision is made for these changes in 1976 , 1977 and 1978.

CIAT's original master plan included an auditorium which has never been built. We believe that, although an auditorium would be a useful addition to the conference facilities, the probable use would not be sufficient to warrant the expense. Instead, we suggest that modifications be made to the amphitheatre building to enable it to be used for the few workshops and conferences that are held with more than 200 people, the maximum number which can fit into our largest conference room.

Experimental work at CIAT has been hampered by soils not being homogenous because drainage is poor, rainfall low and evapotranspiration high, leading to accumulation of salts. An improvement program involving improved drainage, levelling and chemical applications is proposed. This could be done over a two year period at a cost of approximately $ 25,000 per annum.

All services roads in the experimental area of the farm are dirt roads. In the dry seasons, vehicular traffic raises dust which affects experiments. We propose treating 8 Km. of the principal arteries with a semi-asphalt cover at a cost of approximately $ 35,000.

Equipment and sundry other needs of each program are detailed in the following table, which is largely self explanatory. These needs have been carefully reviewed :

	1976	1977	1978	1979	1980
BEEF	92,350	200,000	200,000	200,000	20,000
Agrostology					
2 garden tractors	2,500				
Plot mower	1,250				
Scale	600				
Seed Production					
Suction harvester	3,000				
Crop dryer	11,500				
Windrower	7,500				
Seed cleaner	3,750				
Planter & fertilizer unit	3,000				
Mower	2,500				
Sundry items	3,000				
Pastures & Forages Utilization					
Post hole auger	1,250				
Water pumps	1,250				
Mower	1,000				
Husbandry					
Tractor	3,000				
Metabolism crates for steers	6,000				
Soils Agronomy					
Laboratory & greenhouse equipment	3,750				
Experimental seeders and tillers for pasture establishment	6,000				
Crop planter & fertilizer applicator	4,000				

	1976	1977	1978	1979	1980
Soil Microbiology					
Furniture	1,500				
Laboratory& greenhouse equipment	4,000				
Animal Health					
Centrifuge	2,000				
Incubator	2,500				
Sundry items	2,500				
Vehicles					
Pickups (3)	15,000				
CASSAVA	45,000	20,000	20,000	20,000	20,000
Physiology					
Leaf chambers	2,500				
Breeding -Sundry items	1,000				
Pathology & Entomology					
Growth room	8,500				
Electric balance	3,000				
Inoculation room	1,000				
Sundry items	1,500				
Soils - Sundry items	2,000				
Agronomy					
Back pack sprayers	500				
Furniture	10,000				
Vehicles - 3 pickups	15,000				
BEANS	103,550	20,000	20,000	20,000	20,000
Humidity control units (2) for germplasm bank	30,000				
Portable irrigation unit	2,500				
Electronic seed counter	3,000				
Cold room	7,500				
Screenhouses (2)	5,000				

	1976	1977	1978	1979	1980
BEANS Cont.					
Portable leaf area meter	5,000				
Seed germination units (2)	10,000				
Recording mettler balance	5,000				
Dissecting microscope	1,250				
Laminar flow hood	1,800				
Linear solarimeters (10)	5,000				
Daily integrators (10)	2,500				
Furniture	10,000				
Vehicles - 3 pickups	15,000				
ECONOMICS	2,000				
Furniture	1,500				
Calculator	500				
TRAINING AND CONFERENCES	10,000	-	1,000	2,000	1,000
Furniture	4,000				
Typewriters (2) & Calculators	1,000				
Vehicles - 1 Sedan	5,000				
LIBRARY & INFORMATION SERVICES	82,500	40,000	40,000	40,000	40,000
Library					
Typewriters (2)	1,000				
Cardfiles	2,000				
Microfilm cabinets	2,000				
Microfilm making equipment	18,000				
Miscellaneous equipment, etc.	2,000				
Books (1,500)	22,000				
Information Services					
Photomechanics camera	12,000				
Collator	6,000				
Bi-color head for offset press	4,000				
Slide projectors & tape recorder system	2,000				
Miscellaneous	4,000				
Buseta for visitor services	7,500				

	1976	1977	1978	1979	1980
Biometrics	2,000				
Calculator	1,000				
Desks & filing cabinets	1,000				
STATION OPERATIONS	57,500	20,000	20,000	20,000	20,000
Grain silos (4)	15,000				
Grain cleaner	2,500				
Lining of canals	10,000				
Irrigation equipment	10,000				
Tractor	15,000				
Vehicle - 1 Sedan	5,000				
ADMINISTRATION	55,100	10,000	10,000	10,000	10,000
Executive Officer					
Medical equipment	1,500				
Fire extinguishers, security & first aid equipment	4,000				
Typewriters (2) -calculators (3)	2,500				
Furniture	2.500				
Renovation of Bogota Office	2,500				
Radio-telephone equipment (2)	1,000				
Merchandise handling equipment	1,000				
Vehicle for mail service-pickup	5,500				
Controller					
Calculators (5)	3,000				
Card storage units	1,000				
Furniture	2,600				
Date and time stamps (2)	1,300				
Food & Housing					
Double sink	600				
Stainless steel table	600				
Utility trucks	2,000				
Professional food blenders (2)	1,500				
Sundry equipment	1,000				

	1976	1977	1978	1979	1980
Office of the Director General					
Vehicles for visiting scientists & postdoctorals – 4 pickups	20,000				
Sundry equipment	1,000				
GENERAL OPERATIONS	22,000	10,000	10,000	10,000	10,000
Cleaning equipment	3,000				
Maintenance equipment	5,000				
Gardening equipment	2,000				
Motor Pool equipment	2,000				
Vehicles – 2 pickups for motor pool	10,000				
	472,000	320,000	321,000	322,000	141,000