



FUNDING PROPOSAL 1990

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Research Highlights 1989

In the IITA Medium-Term Plan, 1989-1993, the allocations for 1989 included the development of 2 new substations and the Biotechnology Unit at IITA, Ibadan; and an increase of 7 essential scientists over the number in 1988, 2 of them being research liaison scientists.

Development of new substations. IITA has made significant progress in developing a substation for research on cowpeas adapted to the cereal-based systems of the savanna agroecological zone, at Kano, Nigeria, with the collaboration of the Institute of Agricultural Research at Ahmadu Bello University. IITA is also cooperating with ICRISAT which has a station located near this 40-ha research site. Research on cowpeas as a component of the cereal-based system was started by a breeder in 1988 and will be further strengthened by the addition of a plant physiologist in 1989. It is highly significant that near-immunity of a cowpea line to the strains of *Striga gesnerioides* found in the dry savanna zone was recently verified and the line put to use in the breeding program at Kano.

IITA has made a request to the Ministry of Foreign Affairs, Côte d'Ivoire, for an agreement to develop a substation in the moist savanna zone of that country, for research on maize and maize-based systems. IITA will collaborate with the National Maize Research Program, of the Institute of Savannas (IDESSA), in developing the substation which will be located at Ferkessedogou.

The IITA Biological Control Program (BCP) moved from Ibadan, Nigeria to new facilities at Cotonou, People's Republic of Benin in 1988. These new facilities, including environmentally controlled glasshouses for research on pests and their potential biological agents, provide a unique facility for biological control research in Africa. BCP continued its work on cassava mealybug control in East and Central Africa, and research on the cassava green spider mite. In addition, a biological agent (a wasp) for the control of mango mealybug was introduced and released in the People's Republic of Benin. A recent survey

has confirmed the effectiveness of this mango mealybug control measure, thus demonstrating the opportunistic nature of biological control research.

Biotechnology Unit. The facilities previously occupied by BCP on the IITA campus at Ibadan, Nigeria have been remodelled and equipped to form the new Biotechnology Unit. The initial work of this Unit has focused on various biotechnology approaches to (a) host plant resistance to a number of cowpea insect pests; (b) development of monoclonal probes for virus detection in our major crops; and (c) tissue culture and embryo rescue activities in cassava, yam and plantain. The Unit has developed collaborative research agreements with a number of developed-country laboratories. We plan to collaborate in using, among other research initiatives, restriction fragment length polymorphism (RFLP) techniques in gene mapping for specific African problems in conventional breeding programs.

The Essential Program

In keeping with the IITA Medium-Term Plan, essential scientific activities have increased in resource management research (by 2 scientist-years) and in commodity improvement research (by 4 scientist-years), and decreased by 1 scientist-year in crop management research.

The Resource and Crop Management Program continued its work in developing economically and ecologically viable farming systems for increased and sustainable production by the family farmer, while conserving the natural resource base. The soil continues to be the resource of major concern. The program is also examining the productivity of other resources such as water, solar radiation, labor and other energy sources, crop planting material and fallow vegetation, and material inputs such as fertilizer and chemicals. Studies continued on the sustainability of alley farming systems in the transition zone and on the establishment of alley farming research at 65 on-farm sites near Ibadan and in other countries. Many of those farm sites have used oil palm or plantain within the hedgerow, enhancing the economic viability of this agroforestry system for the farmer. The Alley Farming Network for Tropical Africa (AFNETA) became active in 1989, involving national agricultural research scientists from many African countries in adaptive research on this promising technology for the use of farmers in cassava, maize or rice intercropping systems.

A total of 17.5 scientist-years are devoted to crop management research in three major cropping systems: cassava-based, maize-based and rice-based systems. The focus is on (a) evaluation of technology at the farm and village level, (b) adaptation of new

technologies, and (c) provision of information from farm-level characterization, diagnosis and adaptive research to scientists in the several resource management and crop improvement programs at IITA.

The IITA/CIAT Collaborative Study on Cassava in Africa (COSCA) began in 1988 and will provide useful data on cassava production and utilization patterns in Africa.

Commodity improvement research on cassava in 1989 focused on agroecological adaptation and on quality characteristics. The importance of these later traits is being confirmed in farm and village research activities by the cassava-based systems working group. Genetic research has identified natural triploids and tetraploids in cassava, and apparent apomixis in inter-specific hybrids, which open new opportunities for improvement.

Scientists at IITA's existing humid-forest substation at Onne, Nigeria, have demonstrated that all available African plantain germplasm accessions are susceptible to black Sigatoka disease, but that diploid bananas exist which are resistant. Crosses between plantain and a black Sigatoka-resistant diploid banana have, in some cases, yielded up to 169 hybrid seeds per bunch. Nearly 100 plants grown from the hybrid seeds were screened for resistance to black Sigatoka disease and several seedlings were found to be resistant. In addition, four ABB cooking bananas with resistance to black Sigatoka were identified and are being rapidly multiplied in vitro for distribution in collaboration with INIBAP.

In maize research, the success of the inbred-line project encouraged the Nigerian government in 1982 to support an expanded project to develop hybrids that could stimulate commercial seed production and distribution by the private sector. By 1984, hybrids produced at IITA had helped promote the establishment of two Nigerian private seed companies. In 1988, the Maize Research Program's entomologists concentrated on host plant resistance to pests and, jointly with scientists from the People's Republic of Benin, continued investigation on the mechanisms of resistance to maize storage insects.

International Cooperation

Research Liaison Scientists. Two research liaison scientists have been recruited. The first is responsible for the Central African region, while the second is responsible for selected countries of West Africa. Action is being taken to recruit a third by the end of 1989 who will cover the remaining countries of West Africa.

Resident Scientist Teams. There are 39 resident scientists working in 5 projects: the National Cereals Research and Extension (NCRE) Project and Root Crops Improvement Program in Cameroon, the Applied Agricultural Research (RAV) Project in Zaire and the Grain Legume Development Project and Smallholder Rehabilitation and Development Project in Ghana. This represents a decrease of 2 scientists in comparison with Medium-Term Plan projections.

Visiting Scientists. The Maize Research Program has sponsored 2 visiting scientists from Ghana, one for 3 months and the other for 12 months.

Training. Of the 3 essential positions in the Medium-Term Plan, 2 have been filled. An offer has been made for the remaining position, the training materials specialist.

Of the 15 projected essential Graduate Research Fellowships, 10 have been awarded. The remaining 5 will be awarded by the end of 1989. In addition, 42 desirable fellowships, as against 45 projected, were awarded in 1989. Some of the fellows are studying and doing their research abroad while others are conducting research at IITA.

In 1989, 10 essential on-campus courses will be offered, although 8 had been planned. The 2 essential additions concern alley farming and the COSCA course for village-level surveys. Both relate to essential activities of IITA.

In Cotonou, 2 desirable courses are being held in 1989.

IITA has increasingly decentralized its training activities: 3 essential off-campus, in-country courses have already been offered in root crops production and in maize and cowpea production; 2 desirable in-country courses are scheduled, one in Kenya on the management of vegetative seed in collaboration with CIP, and the other in Mozambique, on root crop production.

Research Program 1990

The IITA Medium-Term Plan provides in 1990 for the development of a substation in the humid forest agroecological zone and increases of 3 essential senior scientists, 6 postdoctoral fellows, and 1 research liaison scientist in the International Cooperation Program. These additional resources are mainly for humid-forest resource management research and improvement of cassava. The substation, to be operable early in 1990, will be staffed with scientists who will (a) continue farmer-based studies, started earlier, which examine fallow management strategies and responses to population pressure and which identify the major plant species in the natural fallow; (b) quantify soil chemical parameters affecting productivity with emphasis on organic matter, soil acidification and nutrient leaching and recycling; (c) identify soil fauna influencing organic matter, nitrogen production and cycling, and phosphorous uptake; (d) screen woody species and herbaceous plants for use in fallows and alley-farming systems; and (e) breed cassava.

Resource management research in the transition zone will continue at Ibadan during 1990 with increasing emphasis on (a) long-term studies of nutrient management and cycling in alley farming systems on degraded and non-degraded alfisols; (b) soil microbiological studies of nitrogen cycling and related biological processes in fallow management systems; (c) studies of crop competition in alley farms and traditional mixed cropping systems in order to determine the optimum arrangement of alley and crop species; (d) studies to determine the effective control of weeds, particularly *Imperata cylindrica*, through the selection and management of fallow species; (e) development and testing of new fallow management systems and appropriate fallow species; and (f) studies on the establishment of different alley species.

Resource management research will also continue in the moist savanna zone and the inland valley ecosystem. For the inland valleys, 1 hydrologist (desirable) will be added in order to study the effect of fluctuations in the water table on soil chemical properties and nutrient management.

Crop management research will continue during 1990 within the framework of the three crop-based systems (cassava, maize, rice) working groups. The essential and common activity of the three working groups is crop systems research with an on-farm emphasis. Their main shared objective is to (a) test and adapt improved cropping systems which integrate component technologies from the commodity improvement programs with the resource system technologies devised through resource management research. This work is planned with inputs from appropriate members of each group, but is conducted by the full-time staff of each working group. Other objectives are to (b) characterize the agroecological and socioeconomic environment of the cropping areas; (c) strengthen the farming systems orientation of commodity improvement scientists; and (d) enhance their knowledge and understanding of the target family farmers. In this way, the working groups will improve their ability to define appropriate breeding objectives and to identify long- and short-term issues to be addressed by more applied strategic research on-station. This latter work is planned by the working group but conducted by the appropriate research program.

Initiatives on crop utilization research will be deferred to 1991 and will be based on the findings of a strategic study of the utilization and postharvest needs for IITA mandated crops, which will be concluded in 1989.

The Biological Control Program continues studies on the control of the cassava green mite and has initiated systems analyses of maize and cowpea pests in order to ascertain pest management interventions. The problem of the larger grain borer, an introduced storage pest of maize, is being examined for conventional biological control. As a desirable activity, the control of cassava mealybug continues over the entire area of its distribution in Africa, and the release of natural enemies of mango mealybug by national biological control programs, supported by IITA, continues in selected areas.

In 1990, a cassava breeder will be located in the humid forest substation to begin cassava improvement for specific constraints (particularly acid soil) of this agroecological zone. Plantain research capacity, delayed from 1989, will be expanded with another plant breeder and a pathologist, who will work on specific selection criteria for tolerance to black Sigatoka disease among the new hybrids being generated at the IITA substation in Onne, Nigeria.

The Maize Research Program will continue to work on the development of host plant resistance to the major pests, including *Striga*, and to drought and elemental stresses.

Adaptation of the crop to the major agroecological zones in West and Central Africa will also continue.

The Grain Legume Improvement Program will continue to improve cowpeas and soybeans. The effort to develop a range of photosensitive, indeterminate cowpeas will be enhanced, focusing on adaptation to a range of season lengths, with selected characteristics of traditional varieties grown in mixtures with sorghum and pearl millet, and with multiple resistance to the major pathogens of the West African savanna. With input from the Biotechnology Unit and continued collection of germplasm by the Genetic Resources Unit, improved sources of resistance to cowpea pests will be identified.

The increase in postdoctoral fellows will permit greater in-depth and strategic research related to essential elements of the IITA Medium-Term Plan.

International Cooperation

The research liaison scientists of the International Cooperation Program plan to identify research and training needs in all the countries of West and Central Africa in relation to IITA's mandated activities. In addition, the Program will continue to monitor activities in 20 projects in West and Central Africa where IITA resident scientists are based. The Program will select 2 visiting scientists for attachment to IITA research programs.

The Training Program will manage a total of about 60 fellowships, and will conduct or help in implementing a total of 22 short-term technology transfer courses on or off campus.

Proposals for Essential and Desirable Activities 1990

Research Programs

Essential activities. The 1990 research program of IITA seeks no change in the total number of essential senior scientist positions in the Medium-Term Plan; i.e., 88 scientist-years. There are, however, changes in the sequence of staff recruitment and in allocation among research activities. Following the internal review of the Grain Legume Improvement Program (GLIP) in 1988, it was considered necessary to advance the recruitment of the cowpea physiologist from 1991 to 1989, in order to provide for a viable team at the new substation at Kano, Nigeria. We have also advanced the recruitment of a pathologist for GLIP from 1991 to 1989, in order to support activities at headquarters and the Kano substation. In substitution we have delayed the recruitment of a cowpea breeder in GLIP because this position will become more useful with the development of the Biotechnology Unit. We have also postponed recruitment for the position in postharvest utilization pending the outcome of the current strategic study in this area.

Our capability in rice improvement research has been reduced to 2 senior scientists, following the resignation of the pathologist which was not anticipated in the Plan.

An essential element of the IITA Medium-Term Plan is the development of substations in the (a) dry savanna, for work in cereal-based systems involving cowpea; (b) moist savanna, for work on maize-based systems; and (c) humid forest zone for resource management research and cassava improvement for the cropping systems of this ecological zone. Establishment of the dry and the moist savanna substations began in 1989. The program for 1990 includes development of the third substation, in the humid forest. IITA recently signed an agreement with the government of Cameroon for the development of that substation. A 1,000-ha site of humid forest on acid soil near Mbalmayo (45 km from Yaounde) has been provided by the government, in addition to land at the Institut de Recherche Agronomique, Nkolbison station, near Yaounde. Related essential activities in

1990 are the development of offices, laboratories and field research facilities of this substation, which will become a major center for work on sustainable agricultural systems for the humid forests.

Desirable activities. There are no changes in the total number of scientist positions for desirable activities, but some activities have been modified.

In the transition zone, the co-ordination of the activities of the Alley Farming Network for Tropical Africa (AFNETA) requires a second staff member to serve as assistant coordinator, reflecting the importance of this agroforestry system and the interest generated in it, both among donors and national systems. This desirable position will be filled by rephasing the recruitment of planned staff. For example, recruitment of the agroclimatologist was deferred because the relevant research objective is currently being met through a contract with the Australian National University.

The Biological Control Program as a component of plant protection research has 4 desirable positions, which include the additions of a co-ordinator for the East African region and of a pathologist. The 4 essential scientific positions are dedicated to basic work on plant protection research, which includes studies on the bionomics and ecologies of the pests and their exotic and indigenous natural enemies. When the results of these studies become available, specialists in the development of pest management intervention for specific pests will have to be recruited. The nature of the specialists will evolve, but the number of positions will be constant. For the present, the 4 desirable scientists are involved primarily in research on the control of the cassava mealybug and the cassava green spider mite in Africa.

The number of desirable staff for cowpea improvement has been reduced from 5 to 4, because physiological work on adaptation of cowpea to the cereal-based systems in the dry savanna is considered essential. The position of physiologist became an essential one in 1989 as part of the rephasing of recruitment, a change which has had no impact on total essential scientist-years. Of the 4 desirable cowpea scientists, 1 is a member of the CIMMYT team in Ghana working on cowpeas in the Ghana Grains Development Project at the Crops Research Institute, Kumasi. The other 3 will form a team based at Maputo, Mozambique, for the purpose of generating technologies which will facilitate increases in production of cowpeas, in cooperation with the Southern African Center for Cooperation in Agricultural Research (SACCAR) of the Southern African Development Coordination Conference (SADCC), which coordinates several projects including that of GLIP.

International Cooperation

Essential activities. The total essential program requirements for 1990 are: (a) 3 research liaison scientists, to cover the 24 countries of West and Central Africa; (b) 3 training officers who will service 20 graduate research fellowships, being an increase of 5 over 1989; (c) 10 short-term, on-campus courses and 3 short-term, off-campus courses, and (d) 2 visiting scientists who will spend up to 1 year of attachment in IITA research programs.

Desirable activities. The total desirable requirements for 1990 are (a) 39 resident scientists who will continue to assist national agricultural research systems in various countries of West and Central Africa; (b) 40 postgraduate fellows who conduct research for their degrees at IITA; and (c) 4 on-campus, short-term courses and 5 off-campus courses.

Funding Proposals and Financial Outlook 1990

The 1990 funding proposals correspond with the 1990 section of the ~~Medium-Term~~ Plan document, adjusted for financial changes. The most significant ~~financial~~ change is reduction in the estimated cost per senior man-year to \$174,000 from the ~~Medium-Term~~ Plan figure of \$183,500, as a result of the saving achieved during 1988 and 1989. This ~~saving~~ in essential activities is shown below.

Essential program requirements	Senior man-years (SM-Y)	Rate per SM-Y US\$ 000	Total US\$ 000
Per Medium-Term Plan	106	183.5	19,451
This proposal	106	174.0	18,444
Saving			1,007

For the purpose of the 1990 desirable program requirements, the ~~saving~~ of \$9,500 per senior man-year has been confined to research personnel and has not ~~been~~ anticipated for resident scientist teams. The saving is computed as follows for research costs.

Desirable program requirements	Senior man-years (SM-Y)	Rate per SM-Y US\$ 000	Total US\$ 000
Per Medium-Term Plan	18	183.5	3,303
This proposal	18	174.0	3,132
Saving			171

The projections include price requirement adjustments of \$13 million for the essential program and \$0.5 million for the desirable program. The extent to which these estimated costs may be offset by continued IITA participation in the Nigerian Debt

Conversion Program in 1990 cannot yet be determined. There may be scope for saving in this regard. An estimated saving of \$500,000 has been built into the 1990 projections arising from a combination of Debt Conversion Program activity and exchange gains.

It is necessary to stress that planned 1990 essential research programs will require a significant increase in donor funding over 1989 levels. The level of estimated expenditure in 1989 (\$24.063 million) was determined by available funding, which (Table 3) fell well below the level required by the IITA Medium-Term Plan (\$27.951 million). Total costs for 1989 and 1990 as summarized in Table 4 are reproduced here to illustrate the magnitude of these increased funding requirements.

Essential Program: Total Expenditures, 1989 and 1990

1989 US\$ 000		1990 US\$ 000		1990 projected less 1989 estimated	% increase in costs
planned	estimated	planned	projected	US\$ 000	
27,951	24,063	28,319	27,100	3,037	12.6

Expenditure in 1989 was therefore constrained by the level of available funding. This resulted in the deferment of expenditures, with the pressure alleviated by delayed recruitment of approved senior scientist positions until the latter half of 1989. Forecast personnel costs in 1990 are \$13 million, as opposed to \$11.6 million in 1989 (see Table 4). The additional costs of \$1.4 million reflect the increased staffing requirements for the approved positions.

In 1989 IITA will receive \$5.5 million in grants from the World Bank, or 24% of essential grant funds for that year, as against total World Bank funding to the CGIAR which has been estimated at \$33 million or 14.8% of over-all requirements for 1989. IITA acknowledges its overdependence on World Bank funding support in order to achieve its research program. Any reduction in World Bank funding to IITA in 1990 would require corresponding increases from other donors if Medium-Term Plan targets are to be fulfilled.

Financial Outlook 1989

Table 4 gives a breakdown of 1989 essential and desirable requirements by object of expenditure. Essential requirements amount to \$24,063,000. This is the anticipated minimum necessary level for 1989 agreed by the CGIAR Secretariat in January 1989. By December 1989, IITA expects to have recruited up to the authorized number of senior scientific positions provided in the Medium-Term Plan.

Table 4 includes desirable program expenditure amounting to \$13,573,000 of which \$3,600,000 relates specifically to the activities of the Biological Control Program.

An exceptional net exchange gain of \$1 million is estimated to arise from the Nigerian Debt Conversion Program in which IITA is a participant. The extent of the total 1989 gain and its disposition are therefore not firm estimates at this point.

IITA expects that actual expenditure in 1989 will be fully funded.

Financial Results 1988 (Actual)

IITA's total grant revenue from all sources amounted to \$33,577,000 in 1988. Other income amounted to \$616,000. Total expenditure, including capital expenditure, amounted to \$31,571,000. In 1988 actual scientist years for essential programs amounted to 46.4, as against to 55 provided in the Medium-Term Plan. This result of unavoidable delays in recruitment will be made up during the second half of 1989, when recruitment to full Medium-Term Plan levels should be completed. The favorable financial outcome for 1988 to a large extent arises from this factor, which also delayed other related expenditures.

Essential capital expenditure amounted to \$4,453,000 which was in line with the Medium-Term Plan forecast of \$4,335,000. In addition, \$649,000 was allocated to the capital development fund for substation development, budgeted for, but not completed during 1988.

The replacement of IITA's present aircraft by a pressurized turbo-prop model was approved as a desirable expenditure for 1989. This was advanced to 1988 with the formal approval of TAC.

Exchange gains amounted to \$547,000. They arose as local currency obligations became less costly in dollar terms. Disbursements to IITA from the CGIAR stabilization fund were reduced by \$400,000 to compensate for this gain.

The 1988 actual results are restated for essential programs in Table 9 and compared with the original estimates contained in the Medium-Term Plan, which was approved in November 1988.

TABLE 1

Funding Proposal 1990: Summary

in US\$ 000

	Medium-Term Plan costs	Proposed costs
Essential Program Requirements (see Table 2a)	28,319	27,100
Desirable Program Requirements (see Table 2b)	14,439	13,991
Total Program Requirements	42,758	41,091

TABLE 2A

Funding Proposal 1990: Essential Requirements

in senior man-years and US\$ 000

Program	Medium-Term Plan		Proposed	
	SM-Y	cost	SM-Y	cost
Resource Management	14.5	2,659	14.5	2,523
Crop Management	17.5	3,209	16.5	2,871
Commodity Improvement	30.0	5,502	30.0	5,221
Postdoctoral/Visiting Scientist	(20.0)	1,000	(20.0)	1,000
Research Liaison Scientists	3.0	550	3.0	522
Total Research	65.0	12,920	64.0	12,137
Training	3.0	1,201	3.0	1,201
Information	11.0	1,132	11.0	1,132
Program Management	9.0	1,834	10.0	2,008
Total Program	88.0	17,087	88.0	16,478
Administration and Operations	18.0	6,806	18.0	6,196
Total Operating	106.0	23,893	106.0	22,674
Capital New		605		605
Replacement		2,195		2,195
Total Capital		2,800		2,800
Total Operating and Capital		26,693		25,474
Price Requirement		1,626		1,626
Total IITA Requirements		28,319		27,100

Note: Numbers of senior man-years (SM-Y) in parentheses for Postdoctoral and Visiting Scientists are not included in totals.

TABLE 2B

Funding Proposal 1990: Desirable Requirements

in senior man-year and US\$ 000

Program	Medium-Term Plan		Proposed	
	SM-Y	cost	SM-Y	cost
Resource Management	4.0	734	4.0	696
Crop Management	3.0	1,059	5.0	1,378
Commodity Improvement	10.0	1,834	9.0	1,566
Postdoctoral/Visiting Scientists	(3.0)	150	(3.0)	150
Total Research	17.0	3,777	18.0	3,790
Training	2.0	1,403	2.0	1,403
Information	-	-	-	-
Resident Scientist Teams	40.0	8,272	39.0	8,098
Program Management and Administration	-	-	-	-
Total Program	59.0	13,452	59.0	13,291
Administration and Operations	-	-	-	-
Total Operating	59.0	13,452	59.0	13,291
Capital		200		200
Total Operating and Capital		13,652		13,491
Price Requirement		787		500
Total IITA Requirements		14,439		13,991

Note: Numbers of senior man-years (SM-Y) in parentheses for Postdoctoral and Visiting Scientists are not included in totals.

TABLE 3

Funding Sources 1988-1990

in US\$ 000

Sources of revenue	Actual 1988	Estimated 1989	Projected 1990
Essential: Unrestricted			
Austria	90	90	
Belgium	635	510	
Canada	1,703	1,503	
China	15	10	
Denmark	97	120	
Finland	0	245	
Germany, Federal Republic of	1,148	1,157	
India	25	25	
Italy	577	570	
Nigeria	67	0	
Norway	559	598	
Netherlands	693	663	
Sweden	177	216	
United Kingdom	790	834	
United States of America	5,435	5,435	
World Bank	5,400	5,500	
Stabilization Fund (World Bank)	400	0	
	Subtotal 17,811	17,476	
Essential: Restricted			
Australia	38	81	
Ford Foundation	100	100	
France	238	225	
Germany, Federal Republic of	169	172	
International Development Research Centre	0	160	
Italy	0	150	
Japan	2,516	2,280	
Netherlands	56	307	
Rockefeller Foundation	0	489	
Switzerland	0	933	
United Nations Development Programme	141	337	
	Subtotal 3,258	5,234	
Total Essential Unrestricted and Restricted	21,069	22,710	
Unidentified Funds Required	0	0	26,100
Total Essential Grant Funds	21,069	22,710	26,100
Other Income	616	353	500
Exchange Gains	547	1,000	500
Total Essential Funds	22,232	24,063	27,100
Desirable: Special Projects			
Biological Control	4,867	4,300	3,900
Other	7,639	9,273	10,091
Total Desirable Special Projects Grant Funds	12,506	13,573	13,991

Note The 1988 funding sources are extracted from the audited accounts. They are not strictly comparable with 1989 and 1990 proposals in terms of essential and desirable captions, which did not apply in 1988.

TABLE 4

Program Costs by Object of Expenditure

in US\$ 000

	Actual 1988	Estimated 1989	Projected 1990
Essential Program Expenditure			
Personnel	9,094	11,570	13,030
Travel	910	1,216	1,370
Supplies and Services	5,460	6,997	7,880
Fellowships	817	380	430
Property Plant and Equipment	3,629	3,900	2,800
Price Requirement	-	-	1,590
Total Essential Expenditure	19,610	24,063	27,100
Desirable Program Expenditure			
Personnel		7,050	6,912
Travel		763	775
Supplies and Services		3,130	4,064
Fellowships		1,630	1,540
Total Desirable Expenditure		13,573	13,291

TABLE 5

Balance Sheet 1989 and 1990:
Assumptions

1. Fund Balances

(a) Capital fund reflects additions to Property, Plant and Equipment as follows:

	<i>US\$ 000</i>
Balance as at 31 December 1988	51,677
1989 Additions	3,900
	55,577
1989 Disposals	(327)
Balance as at 31 December 1989	55,250
1990 Additions	2,800
	58,050
1990 Disposals	(150)
	57,900

(b) Operating fund assumes breakeven position in 1989 and 1990. See Table 3 which indicates additional and as yet unidentified revenue requirements in excess of 1989 estimated program expenditure amounting to \$2 million.

2. Cash and Short-Term Deposits for December 1989 and 1990 are in line with Medium-Term Plan and reflect average experience in the last three years.
3. Accounts receivable at December 1988 were exceptionally high due to non-receipt of USAID grants at that date. Projected receivables at 1989 and 1990 anticipate an improvement in grant flows.
4. Inventories are targeted to reduce from average levels of the past three year-ends (\$4.5 million) because of improved controls.
5. Accrued salaries and benefits for 1989 are \$500,000 lower than Medium-Term Plan projection and thereby reflect combination of delays in recruitment and personnel restructuring costs.

TABLE 5

Balance Sheet 1988 and 1990:
Projections*in US\$ 000*

	Actual 1988	Forecast 1989	Projected 1990
Assets			
Cash and Short-Term Deposits	5,293	6,000	6,000
Accounts Receivable			
Donors	8,759	5,500	5,000
Others	821	700	600
Inventories	4,461	4,000	4,000
Other Assets	238	250	250
Property, Plant and Equipment	51,677	55,250	57,900
Total Assets	71,249	71,700	73,750
Liabilities and Fund Balances			
Liabilities			
Accounts Payable and Other Liabilities	7,525	4,736	4,636
Accrued Salaries and Benefits	3,641	4,000	4,000
Payments in Advance by Donors	3,116	3,000	2,500
Total	14,282	11,736	11,136
Fund Balances			
Capital	51,677	55,250	57,900
Capital Development	1,576	1,000	1,000
Operating	3,714	3,714	3,714
Total	56,967	59,964	62,614
Total Liabilities and Fund Balances	71,249	71,700	73,750

TABLE 6

Essential Program and Activity Requirements 1990

IITA Thrust	TAC Activity	SM-Y	US\$ 000
Resource Management Research			
Humid Forest	Measurement of the resource base	1.5	261
	Analysis of determinants of stability and degradation	3.5	609
Transition Zone	Devising resource management technologies	4.0	696
Moist Savanna	Devising resource management technologies	1.0	174
Inland Valleys	Analysis of determinants of stability and degradation	1.5	261
Service Activities	Agroclimatology	1.0	174
	Plant Nutrition (Analytical Services)	1.0	174
	Statistical Services	1.0	174
Total Resource Management		14.5	2,523
Crop Management Research			
Cassava-based Systems	Crop Systems Research	4.0	696
	Utilization Research	2.0	348
	Nutrition/Consumption Studies	1.0	174
	Market Demand Studies	1.0	174
Maize-based Systems	Crop Systems Research	2.0	348
Rice-based Systems	Crop Systems Research	2.5	435
All Systems	Plant Protection Research (Biological Control)	4.0	696
Total Crop Management		16.5	2,871
Total Resource and Crop Management		31.0	5,394
Commodity Improvement Research			
Maize	Plant Breeding/Improvement	4.5	783
	Enhancement	2.0	348
	International Trials	0.5	87
Total Maize		7.0	1,218
Cassava	Plant Breeding/Improvement	4.0	696
	Enhancement	1.5	261
	International Trials	0.5	87
Total Cassava		6.0	1,044
Cowpea	Plant Breeding/Improvement	4.5	783
	Enhancement	1.0	174
	International Trials	0.5	87
	Collection/Conservation/Documentation	0.6	105
Total Cowpea		6.6	1,149

TABLE 6 *continued*

Essential Program and Activity Requirements 1990

IITA Thrust	TAC Activity	SM-Y	US\$ 000	
	Yam	Plant Breeding/Improvement	1.0	174
		Collection/Conservation/Documentation	0.2	35
	Plantain	Plant Breeding/Improvement	3.0	522
	Soybean	Plant Breeding/Improvement	1.0	174
	Rice	Plant Breeding/Improvement	2.0	348
		Collection/Conservation/Documentation	0.2	35
	All Crops	Enhancement (Biotechnology)	2.0	348
		Plant Protection Research (Virology)	1.0	174
		Total Commodity Improvement	30.0	5,221
	Postdoctoral/Visiting Scientists		(20.0)	1,000
	Research Liaison Scientists		3.0	522
	Total Research		64.0	12,137
	Training		3.0	1,201
	Information		11.0	1,132
	Program Management and Administration		10.0	2,008
	Total Program		88.0	16,478
	Administration and Operations		18.0	6,196
	Total Operating		106.0	22,674

Note Numbers of senior man-years (SM-Y) in parentheses represent Postdoctoral or Visiting Scientists and are not included in totals.

TABLE 7

Desirable Program and Activity Requirements 1990

IITA Thrust	TAC Activity	SM-Y	US\$ 000
Resource Management Research			
Humid Forest	Devising Resource Management Technologies	1	174
Transition Zone	Coordination of Networks (Alley Farming)	2	348
Inland Valleys	Water Management	1	174
	Total Resource Management	4	696
Crop Management Research			
Maize-based Systems	Soybean Utilization Research	1	174
All Systems	Plant Protection Research (Biological Control)	4	696
	Total Crop Management	5	870
	Total Resource and Crop Management	9	1,566
Commodity Improvement			
Maize	Coordination of Networks	1	174
Cassava	Enhancement	1	174
	Coordination of Networks	2	348
Cowpea	Plant Breeding/Improvement	4	696
	Coordination of Networks	1	174
	Total Commodity Improvement	9	1,566
Postdoctoral/Visiting scientists		(3)	150
Total Research		18	3,282
Training		2	1,403
Resident Scientist Teams		39	8,098
Total Program		59	12,783
Total Operating		59	12,783

Note Numbers of senior man-years (SM-Y) in parentheses represent Postdoctoral or Visiting Scientists and are not included in totals.

TABLE 8

Essential Staff Positions: Summary

	1988	1989	1990
International	98	104	106
Support	169	136	181
Regular	1,101	971	1,122
Total	1,368	1,211^a	1,409

Note ^a A revision of the personnel structure was effected in October 1988. As part of the restructuring, many general and support staff were released who were unable to meet the new standards. Subsequent recruitment efforts have resulted in their replacement with qualified staff.

TABLE 9

Essential Program Costs 1988

in senior man-years and US\$ 000

Program	Original estimates		Actual	
	SM-Y	cost	SM-Y	cost
Resource Management	11.5	2,109	7.5	1,187
Crop Management	18.5	3,393	13.0	2,057
Commodity Improvement	25.0	4,585	25.4	4,020
Postdoctoral/Visiting Scientists	(12.0)	600	(6.1)	305
Research Liaison Scientists	0	0	0.5	79
Total Research	55.0	10,686	46.4	7,648
Training	3.0	839	2.0	563
Information	12.0	1,216	11.0	1,441
Program Management and Administration	9.0	1,834	9.0	1,934
Total Program	79.0	14,575	68.4	11,586
Administration and Operations	98.0	21,809	87.4	17,782
Capital New		2,545		3,312
Replacement		1,790		1,790
Total Capital		4,335		5,102
Total Operating and Capital		26,144		22,884
Price Requirement		0		0
Total IITA Costs	98.0	26,144	87.4	22,884

Note: Numbers of senior man-years (SM-Y) in parentheses are not included in the totals.