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ICRISAT
Program and Budget Proposals
1985

ICRISAT

International Crops Research Institute for the Semi-Arid Tropics
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ICRISAT
1985 Program and Budget

I. Objectives

- To serve as a world center for the improvement of grain yield and quality of sorghum, millet, chickpea, pigeonpea, and groundnut and to act as world repository for the genetic resources of these crops.

- To develop improved farming systems that will help to increase and stabilize agricultural production through more effective use of natural and human resources in the seasonally dry semi-arid tropics.

- To identify constraints to agricultural development in the semi-arid tropics and evaluate means of alleviating them through technological and institutional changes.

- To assist in the development and transfer of technology to the farmer through cooperation with national and regional research programs, and by sponsoring workshops and conferences, operating training programs, and assisting extension activities.

II. Current Stage of Development

ICRISAT enters the mid-1980s on target with the priorities set forth in our 10-year Plan for this decade, "ICRISAT in the Eighties."

- We have completed ICRISAT Center, our headquarters in India, and embarked on strong regional research efforts in the semi-arid tropical zones of Africa, Latin America, and West Asia. We expect to develop regional cooperation in South and Southeast Asia served by our headquarters staff.

- Improved cultivars of our mandate crops, carrying resistance to diseases and pests in addition to higher yields, are now being released to farmers by national programs in several countries of the SAT.

- Improved technology in farming systems is being field tested on farms in four states of southern and central India and is meeting with encouraging results and an enthusiastic response by farmers and agricultural officials of the region.

- We have added substantially to our world collection of genetic resources of mandate crops and will preserve them for future

generations through long-range cold storage facilities now being completed at ICRISAT Center.

Our principal growth and development in the mid-1980s will be in expanding our regional research efforts in Africa. Research in the drought-prone Sahelian zone has been started in millets and farming systems from the new Sahelian Center now being established at Niamey, Niger. In sorghum, we have had interdisciplinary teams posted at Kamboinse Research Station in Upper Volta and at Samaru, Nigeria. The subject of regional sorghum research in West Africa is now being reviewed with a view to consolidating resources into a single multidisciplinary team. We are also carrying out cereals research in Mali, and the Sudan. Groundnut research will be added to the work of the Sahelian Center in the last half of the decade. The Center also serves as headquarters for our West Africa programs. Principal staff there in 1984 numbered 15, including 10 ICRISAT core positions, 1 contract position supported by IRAT/UNDP, 2 from IFDC, 1 from Government of Netherlands, 1 from ILCA, and 1 from IITA.

In addition, we have undertaken a major new research initiative in cereals improvement in southern Africa in response to a request from the heads of state of the nine member countries of the Southern African Development Coordination Conference (SADCC) for ICRISAT assistance in improving food production of the region. An interdisciplinary team of scientists is now being assembled and posted in Zimbabwe to work on this special project financed by USAID. Other regional research programs in eastern and southern Africa are being carried out by a cereals coordinator posted at Nairobi, Kenya, and a groundnut breeder and pathologist based in Malawi.

We also are developing in 1984 a regional approach to improvement of grain legumes (groundnut, pigeonpea, chickpea) in most of southern Asia. The program stems from a meeting at ICRISAT Center in December 1983, attended by representatives of research organizations in India, Indonesia, Malaysia, Nepal, Pakistan, the Philippines, and Thailand, and several international organizations with responsibilities for agricultural development in Asia. The regional grain legumes research will be carried out, in close cooperation with national programs, by ICRISAT scientists operating from headquarters at ICRISAT Center.

In India, we have completed the construction of ICRISAT Center. Unfortunately our headquarters research programs have had to absorb the brunt of funding shortfalls the past 2 years in order to carry forward critical long-term objectives in Africa, and we have had to delay filling research positions that are required if ICRISAT is to adequately fulfill its global mission.

III. 1983 Research Achievements

Sorghum

- ICRISAT's elite variety SPV 351 moved to within one step of release to farmers in India.

- The variety SPV 386 was formally released in Zambia and entered into minikit trials on farmers' fields in India.

- The first ICRISAT-produced sorghum hybrid in the Sudan, Hageen Dura No.1, was released to farmers. Pilot scale production of seed of the hybrid was highly successful.

- The hybrid SPH 221 continued to do well in All India trials and is being experimentally produced and extensively evaluated on farmers fields in the State of Maharashtra.

- A labor-efficient, economical stemborer-rearing facility was developed allowing artificial infestation of up to 4 hectares.

- Identification of new mechanisms for resistance to shootfly expanded our screening capability.

- The methodology to screen for resistance to midge improved and several highly resistant agronomically good lines became available.

- High levels of grain mold resistance were found in color grained sorghums--some without testa and low in tannin. This opens the opportunity to transfer increased resistance to white-seeded sorghums.

- We identified and confirmed very high levels of resistance to downy mildew in 12 lines of diverse origin and phenotypic characteristics. Some of these lines are of good agronomic background for immediate use in breeding programs.

- *Striga*-resistant varieties SAR 1 and SAR 2 significantly outyielded the check, CSH 1, on several infested farmers fields in Maharashtra and Andhra Pradesh, India. Seed multiplication of these two varieties is being carried out by the Department of Agriculture and universities in Maharashtra to satisfy farmer demands.

- We developed an improved field technique for screening genotypes for emergence through a soil crust. IS 2877, a germplasm accession of Egyptian origin, emerged 100% when 60% of the entries in the test failed--0% emergence. Some breeders lines such as D 38093 had emergence of 60%.

- Germplasm lines capable of growing and producing grain satisfactorily at very low levels of soil phosphorous (less than 5 ppm) were identified. Two early maturing lines--IS 10734 and IS 10747, from Chad, and IS 1320 from Nigeria had higher yield than the commercially available varieties used as checks. A high percentage of the roots of cultivars most resistant to low phosphorous were colonized by mycorrhiza.

Pearl Millet

- Seed to plant over 200,000 ha of pearl millet variety WC-C75 was sold to Indian farmers in the first year it was made available to them. This variety, high yielding and resistant to downy mildew, has been rapidly accepted by farmers.

- Two ICRISAT/Senegal millet varieties were entered in the CILSS regional West Africa trials. IBV 8004 came first with 16.7% more yield than the check, Souna III, and IPV 8001 gave 11% more.

- In cooperation with Kansas State University, we released two early downy mildew-resistant seed parent lines that will enable breeders in India to make new hybrids in their own localities. These and three others have been distributed through the All India Coordinated Millet Improvement Program so that new hybrids made on them can be tested in 1984.

- Twenty pearl millet lines with multiple disease resistance to all three major diseases--downy mildew, ergot, and smut--have been identified. About half of these lines have performed well agronomically in multilocational testing in India.

- The popular Indian hybrid BJ 104 (5141 x J 104), developed by the All India Coordinated Millet Improvement Project, has shown increasing infection by downy mildew and became extensively damaged in 1983. Using the downy mildew disease nursery we have found residual resistance within both of the parents and extracted highly resistant re-selections so that a resistant version of the hybrid can now be produced.

- In field trials with three millet cultivars interaction for grain production between cultivar and nitrogen-fixing bacteria was observed. Inoculation of BJ 104 plants with Napier-bajra root enrichment culture (a mixed culture) and Azospirillum lipoferum gave 26% and 19% increased grain yield, respectively.

- Recurrent selection was shown to be effective in increasing yield and disease resistance in pearl millet. Average yield gains of 2 to 4.9% per year were measured on 6 high-yielding

composites that had been selected from 2 to 5 cycles over the last 3 to 8 years. These yield gains will be reflected in new varieties to be produced from these composites.

- Two years of testing selections made under high and low fertility from the same source populations indicated that selecting under low fertility has no specific advantage over selecting under high fertility for adaptation to low fertility soils.

- Resistance to late drought stress among a number of good varieties of similar yielding ability under normal conditions differed and was related closely to better maintenance of grain number and 1000 grain weight rather than to head number.

- The 15N isotope dilution technique, with collaboration from Rothamstead Experiment Station, U.K., was tested in pot culture for its application to screen lines of pearl millet for their ability to stimulate rhizosphere nitrogen fixation. Amongst the six lines tested plants of line D 180 derived 17% of total plant nitrogen from biological fixation in comparison with 6% in the low N2 fixing line ICH 107.

Groundnut

- The ICRISAT selection ICGS 11, developed for postrainy season irrigated conditions, was promoted to minikit trials on farmers' fields in the central and peninsular zones of India. Three other selections are in the national evaluation trials.

- Three lines resistant to rust and late leaf spot yielded over 3,000 kg/ha in 1983 rainy season trials in low fertility, unprotected, rainfed conditions.

- Genotypes with resistance to foliar diseases and some with good yield potential were derived from crosses between wild species and cultivated groundnuts. These are being used as parents in breeding programs.

- Genotypes were identified with tolerance to mid-season and end-of-season droughts, which are common drought patterns in the semi-arid tropics.

- Genotypes with multiple pest resistance were used in breeding programs and some of their progenies have shown similar resistance.

- In collaboration with scientists of Andhra Pradesh Agricultural University, we investigated a new disease of groundnut pods and identified the causal nematode.

- Resistance to pod-scarifying termites has been identified in 10 genotypes.

- The genotypes EC.76446(292) and NC Ac 17133(RF) have shown zero seed transmission of peanut mottle virus and the genotype NC Ac 2240 has been shown to be tolerant to this disease.

- When the cultivar TMV 2, susceptible to bud necrosis disease, was grown intercropped with pearl millet it showed 40% less incidence of the disease than when grown as a sole crop.

- A genotype from the cross Manfredi x NC Ac 343 showed only 5% field incidence of bud necrosis disease compared with 95% incidence in cultivar TMV 2 grown in the same trial.

Chickpea

- ICCC 4 was released for general cultivation in Gujarat by the State Varietal Release Committee. The cultivar gives higher yields and is superior in cooking quality. In trials over 5 years it gave average yields of 2000 kg/ha.

- ICCC 37 was the highest yielding entry in the Gram Initial Evaluation Trial in the peninsular zone of India (GIET-PZ) of the All India Coordinated Pulse Improvement Project, giving 2400 kg/ha. Two other ICRISAT entries (ICCC 35 and ICCC 38) ranked fourth and fifth, respectively, in the trial.

- A germplasm line, P 1329, produced more than 3000 kg seed/ha in early-sown trials at ICRISAT Center, ranked first in trials sown at the normal time, and has been contributed to the All India Gram Initial Evaluation Trial-Peninsular Zone in 1983-84. Five other entries have also been submitted to the Gram Initial Evaluation Trial.

- Some chickpea pods with six seeds were identified among multiseeded plant materials at ICRISAT Center. Pods normally have one or two seeds.

- We have developed large-seeded, short-duration kabuli types and double-podded types with wilt resistance, combinations not identified earlier in the chickpea germplasm collection.

- Based on multilocational testing over 3 years, an effective chickpea Rhizobium strain (IC 76) has been recommended for use by inoculant manufacturers in India by the All India Coordinated Pulses Improvement Program.

- By generating information on stages of growth most responsive to photoperiod, and the number of long days required to

complete one generation, we have devised a Rapid Generation Turnover (RGT) technique that enables breeders at ICRISAT Center to harvest more than two crops a year.

- In continuation of efforts to incorporate high levels of resistance to Heliothis, we tested materials developed by our breeders from resistant material identified earlier, and were encouraged by the results.

- We found in continuing studies of the wilt fungus that it could survive for up to 63 months in the soil, and up to 39 months in infected roots buried 60 cm deep in the soil, indicating that crop rotations are of no value in controlling this disease.

- In multiple disease resistance screening, we identified eight lines that combined resistance to fusarium wilt and dry root rot; one to wilt and botrytis gray mold; one to wilt and ascochyta blight; one to botrytis gray mold and ascochyta blight; and one to stunt and ascochyta blight.

Pigeonpea

- ICPH 2, which is the most widely tested pigeonpea hybrid in the world, is under intensive final tests by the Indian national program to determine its suitability for release to farmers. In 4 years of advanced trials it has consistently outyielded the standard checks in peninsular India. Several of our newer hybrids (ICPH 6, 7, and 8) are also showing promise.

- Our lines in multilocational trials in the Indian national program are performing well. These include ICPL 81, a very early line with high yield; ICPL 161, an early line with phytophthora resistance; ICPL 270 and 295, medium maturity lines with wilt resistance; ICPL 304, a medium-maturity line with wide adaptability; and ICPL 358, a late line with a very high yield potential. ICPL 87, an early line with large seed, has been identified for release in peninsular India.

- We have developed several medium-maturity lines with resistance to wilt and sterility mosaic, which have outyielded the standard check in preliminary yield trials under disease-free conditions. We also now have early maturity lines resistant to these two diseases. One early line, ICPL 161, resistant to phytophthora blight, has been giving yields up to 3200 kg/ha in multilocational trials.

- Two lines from the cross ICP 1900 x BDN 1 showed a clear-cut superiority over the standard susceptible check in resistance to Heliothis attack. The agronomic value of this material and

of resistant lines from the entomologists is being tested in comparison with standard checks under sprayed and unsprayed conditions.

- We have identified high protein lines (about 30% consistently vs 22% for the standard check) with acceptable seed size and color from some of our intergeneric crosses.

- One of our Rhizobium strains, IHP 195, has been recommended by the All India Coordinated Pulses Improvement Program for use as an inoculant with pigeonpea, after giving good results at several test locations in India.

- We had short-duration pigeonpeas yield a total of 5000 kg/ha in three harvests over a 220-day period in test environments in peninsular India, where farmers usually grow medium-duration cultivars that yield 2500-3000 kg/ha in two harvests over 240 days.

- We extended our network of pheromone traps (now 114 traps spread over 57 locations), in collaboration with the Tropical Development and Research Institute (TDRI), UK, and with entomologists throughout the Indian subcontinent. The traps attract male moths of Heliothis and help us to monitor populations across area and season.

- We identified 21 new wilt-resistant germplasm lines after 3 years of testing in a wilt-sick plot. In multilocational tests in India, ICP 8863 and ICP 9168 were found resistant at 9 of 11 locations; 6 of our lines in Kenya and 10 in Malawi were found free from wilt. To enable testing of elite lines we formulated an International Pigeonpea Wilt Nursery, consisting of 60 entries, for testing at ICRISAT Center, Kenya, and Malawi.

- A 4-year trial on intercropping and crop rotation showed that wilt was much less in a sorghum/pigeonpea intercrop (28%) than in sole-cropped pigeonpea (91%). Wilt was also reduced following a 3-year break between pigeonpea crops by sorghum.

Farming Systems

- Verification work for on-farm testing of our deep Vertisol technology in India was carried out this year by State Departments of Agriculture in Andhra Pradesh, Karnataka, Madhya Pradesh, and Maharashtra at 28 locations, covering some 2000 hectares and involving 1406 farmers.

- Seminars and training programs were organized by ICRISAT for extension personnel working in the deep Vertisol project areas

to facilitate the testing of technology and the dissemination process. A total of 380 man-days of training was provided.

- Results of a 4-year test showed that a simple cropping rotation of sorghum/pigeonpea and millet/groundnut could maintain the nitrogen status of an Alfisol and still give moderately high and stable yields without the addition of nitrogen fertilizer.

- We encouraged two new Indian manufacturers of wheeled tool carriers to go into production. The tool carriers and implements, used in our deep Vertisol technology, are now available from three sources in India. We also supplied drawings to potential manufacturers in Bangladesh, Ethiopia, Pakistan, UK, and Zimbabwe.

- We completed the design and construction of a mobile rainfall simulator, which will be used in off-season study of rainfall impact on runoff, erosion, and surface crusting.

- In cooperation with the National Meteorological Services of the Government of Mali, we analyzed the long-term climatic data for Mali and prepared detailed maps showing the rainfall distribution and probabilities as well as durations of the growing period in different areas of the country.

- In studies of water-use efficiency of promising cropping systems on deep, medium deep, and shallow Vertisols and on Alfisols, we found that on deep and medium deep Vertisols cereal-based cropping systems used more water than legume-based systems (except for pigeonpea) at both low and medium fertility. The sorghum/pigeonpea system used water most efficiently on all four soil types.

- Vertisols showed much less response than Alfisols to fertilizer phosphorus applied to sorghum.

- Of the fertilizer-N applied to a rainy season cereal crop, very little (<3%) was taken up by a subsequent postrainy-season crop of safflower.

- In controlling soil and water losses on Alfisols, a modified contour-bund system, which includes gated outlet, land smoothing, and planting on grade instead of on contour was found most effective. The system also increased crop yields by 21%, as compared to the original contour-bund system.

- On Alfisols a nonfurrow-turning tillage system proved better than tillage with furrow turning plows. Severe problems of crusting and sealing were observed in the latter system.

Economics

- We determined that farmers who used improved watershed-based technology in four ICRISAT collaborative verification trials obtained returns that ranged from 26% to 381% on additional investment.

- A whole-farm analysis on the performance of the improved watershed-based technology in Taddanpally village suggests that adoption potential is proportionally greater on small farms without irrigation than on large farms with irrigation. A minimum of Rs 700 per hectare of credit is needed for this potential to be fully expressed. Seasonal labor bottlenecks during planting and harvesting can dampen the spread of the improved technology.

- Results from scenario analysis tentatively dispel apprehensions regarding steep falls in producer prices to uneconomic levels due to moderate increases in productivity in coarse cereals. A simulated 25% increase in sorghum productivity over 10 years results in a 33% increase in production and is accompanied by only a 13% decline in price to farmers.

- In a collaborative study of 1200 people in six study villages, major nutrient deficiencies were energy, calcium, vitamins A, B complex, and C. Protein was generally not limiting. Nutrient intakes were not found to be influenced by the level of household income except for calcium.

- For the poorest rural households in India, making sorghum available through price subsidies would most effectively enhance caloric nutritional status. For other rural and urban households, price subsidies on wheat and rice would be more efficient in improving energy intake.

- Evidence that household income fluctuates in the semi-arid tropics of peninsular India comes from three study villages. The mean coefficient of variation of per person household income averaged 35% over five cropping years. Households that derived more income from crop cultivation were characterized by greater income instability than those who relied more heavily on labor earnings.

- Older farmers, those born into traditional farming occupations, and those who practice hands-on farming had significantly higher returns to management in six villages in India where we have carried out economic studies for some time.

- We documented the important role of common property resources in traditional farming systems in Madhya Pradesh and Rajasthan villages. They contributed about 67 to 95% of total livestock grazing requirements, provided on average 42 to 71 days of employment to each household, and generated 10 to 13% of gross household income through collection of food and nonfood products.

- Modeling results showed that a watershed management system on Alfisols which optimally combines runoff retention structures--such as percolation tanks--with wells for sustained irrigation of crops can substantially increase agricultural productivity and employment over present levels. This may provide a viable and more productive alternative to traditional tank irrigation.

Genetic Resources

- More than 1200 germplasm samples were collected from Cameroon, India, Malawi, Nigeria, Sierra Leone, and Southern Sudan.

- Our seed supply to researchers involved 26 673 samples sent to scientists in more than 30 countries, including 11 035 to scientists in India.

- We received 724 chickpea samples from Washington State University at Pullman, USA, to fill gaps in the set available at ICRISAT.

- In a collaborative project with Cameroon, we transferred and evaluated there samples of the sorghum germplasm initially collected in Cameroon and preserved in the ICRISAT gene bank.

- Passport data of all pigeonpea and chickpea data were entered into the computer and are retrievable; those of up to 10 000 pearl millet and 12 353 sorghum accessions are also available.

- Evaluation data of 12 353 sorghum, 12 500 chickpea, 10 000 millet, 8718 pigeonpea accessions are retrievable from the computer catalogs.

Training

- Nine francophone and 65 anglophone technicians and scientists from 26 countries participated in crop improvement, crop production, and farming systems in-service training programs in 1983.

- We provided training for 14 postdoctoral interns and fellows in 9 research programs at ICRISAT Center and in Mali.

- Students from 17 universities in 15 countries were involved in PhD and MSc thesis research guided by research scientists in 1983.

- Twelve in-service fellows from 5 SAT countries were given intensive skill development at ICRISAT Center.

- Short-term training (5 weeks) was provided for 13 microbiologists from 4 countries, and 2- to 5-day training sessions were held for Indian scientists, administrators, and bank staff interested in the deep Vertisol technology.

- Latin American sorghum technicians and scientists were trained in the ICRISAT program in Mexico, and West African students have continued to conduct their thesis related training program under the supervision of ICRISAT staff in Senegal, Mali, Upper Volta, and Niger.

IV. 1983 Fiscal Performance

ICRISAT requested a budget for 1983 of US $18,380,000 gross in accordance with the recommendations of TAC. The CGIAR approved a budget for ICRISAT within a bracket from $18,380,000 to $17,009,000; the bottom of the bracket being 7.5% below the top. Net funding requirements at these levels--that is, new funds required from donors--were $18,155,000 and $16,784,000, respectively. Actual funds received from donors for 1983 were $16,300,954. A sum of $319,458 was pledged but not received.

The following table shows actual 1983 expenditures against the Budget:

	Budget (US $000)	Actual (US $000)	(Overage) (US $000)
Core Operational	15,832	14,972	860
Capital	1,420	1,691	(271)
Total	17,252	16,663	589

(excluding transferred special projects to core)

The additional expenditure in Capital was made possible because of increased earned income of $265,072 over the original estimated amount of $225,000.

In order to keep the budget within actual levels of funding, most of the recommendations made by TAC for reductions in ICRISAT's program were put into effect. These included reductions in sorghum, millet, and groundnut breeding, in groundnut biochemistry and pulse entomology, and deletion of the

principal sorghum agronomist post in the West African core program. In addition, there was a general reduction in operational levels for almost all programs and divisions.

In accordance with the recently approved 10-Year Plan, ICRISAT strengthened its regional activities in 1983 by initiating an Asian regional network in legume improvement. The objectives of the network will be to assist, strengthen, and stimulate activities on groundnut, pigeonpea, and chickpea in the developing countries in Asia where these crops are grown. Participating countries are expected to include Pakistan, Bangladesh, Thailand, Malaysia, Indonesia, and Sri Lanka. Burma and China may also be added. The project will assist scientists in these countries to participate in cooperative research projects and multilocational trials and to visit ICRISAT at least once a year at the time of the annual field day for each of the crops, to participate in network planning sessions, and to select improved materials from ICRISAT for their own research and trials.

ICRISAT's Farming Systems, Economics, and Training programs expect to be involved with on-farm aspects of the improved deep Vertisol technology in India for 2 years. An allocation of $140,000 in core funds was made in 1984 to continue this work that started in 1983; it will provide additional temporary personnel and some vehicles and allow monitoring of the implementation of this technology at some 20 locations in the vast area of central India to which the technology probably applies. Much of the work involves training and assisting personnel from development banks and State Departments of Agriculture in Madhya Pradesh, Maharashtra, Karnataka, and Andhra Pradesh in learning how to implement the technology and to train their own staff in its use. In addition, valuable feedback is being obtained about the technology and its reception by the farmers inolved in the applied research and demonstration project. The All India Cooperative Research Program on Dryland Agriculture is intimately involved with the on-farm research in Andhra Pradesh.

The CGIAR, on the recommendation of TAC, approved in 1983 the transfer of the following special projects to restricted core:

1. African Cooperative Program for Improvement of Sorghum and Millet - UNDP Duration 1983-1985

The UNDP-supported program of sorghum and millet improvement in West Africa commenced in 1975 and is now in its third phase. The program helps to train national scientists working with these crops, develops new breeding materials for national programs, and provides a major network for regional trials and exchange of

plant material in the semi-arid tropical countries of West Africa. In 1983 UNDP supported research by five millet breeders and one sorghum breeder stationed in Senegal, Upper Volta, Niger, Nigeria, and Sudan.

2. Semi-Arid Food Grain Research and Development - USAID
   Duration 1979-84

SAFGRAD is a joint project between the Organization of African Unity, USAID, IFAD and some other donor agencies. IITA, ICRISAT, IRAT, and Purdue University are the main institutes conducting research work on the main cereal and grain legume crops of the semi-arid areas and on farming systems. Although the program is pan-African in intent, work is concentrated in West Africa. ICRISAT's responsibilities under SAFGRAD are funded by USAID. In 1983 these involved sorghum research and accompanying farming systems research in the wetter portions of the semi-arid region, and development of a regional network for sorghum and millet improvement in the uplands of East Africa.

3. Groundnut Improvement Program in Eastern
   and Southern Africa - IDRC Duration 1982-84

IDRC supported a groundnut breeder and pathologist to conduct research on groundnut improvement for the eastern and southern African region. The program is located in Malawi. It was approved by the CGIAR for core funding in 1980 and 1981 but funds were not assigned to get the program underway. IDRC's support as a special project enabled the project to get underway in 1982 and continue through 1983 and 1984.

4. Rural Economic Research in Africa - IDRC
   Duration 1981-84

ICRISAT's core economics research program in Africa provides support for two economists and some technical staff to undertake a network of village-level studies in the Sahelian region of West Africa. IDRC funds supplement the work of the core program with that of a social anthropologist and additional technical staff. Training opportunities are also being provided for African scientists to learn the methods of this micro-economic farm management research.

5. Sorghum and Millet Information Center - IDRC
   Duration 1982-84

SMIC was established in 1976 to collect, collate, and disseminate information about sorghum and millet among research workers around the world. The project is now in its second phase during which it is expected to set up computerized storage and retrieval systems for better utilization of the large store of material

that has been collected. The project also puts out a regular SMIC newsletter to keep research workers in the field aware of current developments.

6. Tillage Research in West Africa - Netherlands
   Duration 1983-87

The Government of the Netherlands is providing a total of $994,500 in restricted core funds for a cooperative research project on tillage research by ICRISAT and the University of Wageningen to be conducted at the Sahelian Center. The project allows a scientist from the university to work at the Sahelian Center and supplement the work of ICRISAT's farming systems program there. The work began in 1983.

7. Capital Grants for Sahelian Center - Italy and Switzerland
   Duration 1983-84

Two capital project proposals amounting to $4,617,000 were confirmed by the Governments of Italy and Switzerland in June 1983 for assistance in the development and construction of the ICRISAT Sahelian Center near Niamey, Niger, and have now been included in restricted core as recommended by TAC. The total amount of $4,617,000 is to be received in two instalments, with $1,386,000 received in 1983.

8. Cold-Tolerant Food Sorghum for Central America - IFAD
   Duration 1981-84

Work on developing sorghum for the cool, dry highlands of Mexico and Central America was started by CIMMYT in 1970 and became ICRISAT's responsibility in 1977. IFAD funds support a plant breeder and an agronomist in this program, which has proved to be very successful. Several varieties have been developed and released and are now being tested in farmer's field trials throughout the region.

9. Nitrogen and Phosphorus Research in SAT - IFDC/UNDP/IFAD
   Duration 1982-84

UNDP and IFAD are donors to IFDC to study nitrogen utilization in rainfed agriculture in the semi-arid tropics and the beneficiation and utilization of natural phosphate deposits in the Sahel. ICRISAT, as a sub-contractor to IFDC, undertakes much of the field research. The nitrogen work is being done mostly at ICRISAT Center in India and the phosphate research at the Sahelian Center in Niger. The program supports the work of two soil fertility specialists, one at each location, and a soil chemist in Niger who is responsible for soil testing and preparation of soil samples for isotope analysis which is carried out at the IFDC headquarters laboratories in USA.

V. 1984 Prospects

The CGIAR approved a budget bracket for ICRISAT for 1984 the top of which amounts to $23,665,000 in gross expenditures and the bottom to $22,347,000 gross. Special projects transferred to restricted core amount to $4,302,000, including $1,886,000 in capital grants from Italy and Switzerland for the second installments of funding for the Sahelian Center. We have recently been notified by the CG Secretariat that net funding for ICRISAT in 1984 is likely to lie between $21.41 million and $20.69 million for operations and capital, including special projects transferred to restricted core. Our expected earned income is $225,000, giving an expected range of $21,635,000 to $20,915,000 gross income as compared to the approved figures given above.

In view of these reductions in funds, we have eliminated the following positions at ICRISAT Center: 1 scientist position in pulse entomology, 3 scientist positions in farming systems, 2 scientist positions in sorghum entomology and pathology, 1 scientist position in economics. The sorghum agronomy position frozen in 1983 will remain unfilled; it will not be possible to start the groundnut program at the Sahelian Center; and we will continue to have to depend upon special project or restricted core funding for the groundnut program in southern Africa.

Currently vacant Principal Staff positions at ICRISAT Center in millet breeding, cereal microbiology, pulse agronomy, groundnut entomology, soil and water engineering, and economics will be filled. The IFDC-supported restricted core project on soil nitrogen will also continue. The indicated funding should allow us to continue funding at 1983 levels the chickpea improvement project at ICARDA and the cold-tolerant sorghum special project in Mexico and Central America that is supported by IFAD and based at CIMMYT. In West Africa, we should be able to add one position, a millet agronomist, to the Sahelian Center staff to complete the millet improvement team there. The vacant position in sorghum pathology should also be filled. The UNDP-supported project on sorghum and millet improvement will continue as will the tillage research program supported by the Netherlands government at the Sahelian Center. The IDRC-supported projects on groundnut improvement in Malawi and social sciences in West Africa will be continued throughout the year as will the SAFGRAD programs on sorghum and farming systems in West and East Africa, and the IFDC project on soil fertility at the Sahelian Center.

If funds are available above the bottom of the indicated range we would wish to restore operating funds at ICRISAT Center closer to the intended (i.e., approved) 1983 levels. We would also like to increase funds available for training. Only if

significantly more funds were available than is presently indicated--that is, sufficient to carry us beyond the bottom of the approved CGIAR bracket--would it be possible for us to consider adding the additional positions in Africa that were shown in our approved 1984 budget request. First preference would be to make the groundnut program in southern Africa part of the regular core budget.

VI. 1985 Budget Request

TAC has recommended a budget of $23,518,000 for ICRISAT for 1985. ICRISAT's budget proposal includes $21,004,000 for operations, $2,384,000 for capital expenditure, and $130,000 for incremental working capital.

A shift towards more interdisciplinary research with a more pronounced international character, commenced in 1984, will continue into 1985 through internal shifts of resources, the addition of some new posts, and the addition of a new special project on sorghum and millet in southern Africa. The programmatic changes at ICRISAT Center can best be illustrated by reference to the Sorghum and Economics programs.

In recent years the Sorghum program has made good progress on population breeding and in developing efficient screening methods for a number of individual traits. The program, in preparing its 10-year plan, has also identified a number of geographic functional regions. The program is now planning to combine these concepts into a new orientation, mainly utilizing recurrent selection but also other techniques so as to develop six multiple-trait populations each with different and specific sets of characteristics designed to serve different functional regions. Plant materials emerging from this new program will effectively serve national programs in the functional regions and ICRISAT's developing regional programs.

In Economics the major program of village-level studies in India will be phased out to be replaced by research on technology design. This link between analysis and synthesis is presently the least satisfactory part of farming systems research. A monograph on the village-level studies will be produced during 1985 to serve as a basis for the new research and a major source book for social scientists working on agricultural development in semi-arid regions.

By 1985 we expect to bring about a realignment of our regional sorghum and millet research in West Africa to make it more scientifically and cost-effective. The changes, which will require some relocation of staff and changes in scientific

disciplines, are currently under discussion with the concerned governments.

ICRISAT needs to provide more effective communication amongst its units and with other elements of the CGIAR system and strengthen its regional administration and management. The IDRC-sponsored pilot study on computer-based communication in the CGIAR is pointing the way to the future.

ICRISAT's highest new priority request for 1985 is to provide a Director for the Sahelian Center. Other requests are all in the area of outreach and international cooperation--to strengthen training and conference activities, provide for core program research on groundnuts in West Africa, a sorghum agronomist in West Africa as part of the regional sorghum improvement team, and to provide core support for the regional grain legume program in Asia.

VII. Special Considerations

The External Program and Management Review of ICRISAT will take place in 1984. The main period of the review will be in the months of August and September. The itinerary for the review has been agreed to by TAC. It includes visits to our research activities in northern Nigeria and at the Sahelian Center. Thereafter the team will split into two groups. One will visit Pakistan national agricultural research programs and the other will visit ICRISAT-developed sorghum, pearl millet,and pigeonpea under cultivation on farmers fields in Maharashtra and seed production programs of the Government and private organizations there. They will also have discussions with the Coordinator of All India Millet Improvement Program in Maharashtra. The whole team will then meet at Hyderabad for a concentrated 2 weeks of review and report writing at ICRISAT Center and visits to on-farm research of the ICRISAT Farming Systems Research Program in Andhra Pradesh and Karnataka.

The External Management Review will concentrate most of its efforts on reviews at ICRISAT Center at the same time as the External Program Review, but the chairman of the Management Review panel will probably participate in the visit of the Program Review panel to the ICRISAT Sahelian Center.

Because the recommendations of the external reviews will have implications for ICRISAT's 1986 Program of Work and Budget, and because of the financial reporting and budgeting study which will recommend changes in the budget formulation process, ICRISAT has decided to prepare a Program of Work and Budget for 1985 only instead of the normal biennial budget for 1985 and 1986.

A sum of $200,000 has been included in ICRISAT's budget request for 1984 to cover costs of the external reviews.

VIII. Program Commentaries

A. The Research Program

Sorghum

Core

Man Years

Principal

	1983	1984	1985	1986	1987	1988
ICRISAT Center	5	5	5	5	5	5
Africa Core	9	5.5	5	5	5	5
Total	14	10.5	10	10	10	10

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	11	12	12	12	146.5	137	138.5	140
Africa Core	-	-	-		36	19.5	18	20
Total	11	12	12	12	182.5	156.5	156.5	160

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 (Decrease)	1986 Prop	1986 Increase	1987 Proj	1988 Proj
2350	2148	1569	(579)	1609	40	1631	1655

Budget Changes

The Sorghum program in 1985 wishes to embark upon a systematic program of breeding for multiple resistance rather than breeding for yields plus another individual trait. We are developing a set of populations (6) resistant to stem borer, Striga, downy mildew, midge, with improved stand establishment and will try to integrate the traits of these improved lines in a single genotype (see table below). More emphasis will also be directed to developing diverse breeding material for distribution to national programs throughout the SAT for selection and evaluation.

A reduction in staff and funds will occur from 1984 to 1985 because of the termination of some restricted core projects in West Africa. An agronomist position is requested on core funds for 1985.

Table. Coupled sets of traits for sorghum breeding.

1.	Yield	Grain Mold	Midge	Striga
2.	"	SB/SF*	Striga	Rust
3.	"	Grain Mold	SB/SF	St. Est.*
4.	"	Midge	St. Est.	Striga
5.	"	SB/SF	Midge	DM*
6.	"	Grain Mold	St. Est.	Anthracnose

* SB/SF = Stemborer/Shootfly; St. Est. = Stand Establishment; DM = Downy Mildew

Program Commentary

The prime objective of the ICRISAT Sorghum Program is, by working through national programs, to enable small farmers of the SAT to produce consistently improved yields of sorghum--specifically by growing improved varieties and hybrids. To obtain improved sorghum, ICRISAT recognizes that more and improved genetic diversity must be introduced into its breeding program, and that stability is a prerequisite. Varieties and hybrids must be able to perform well in the environment in which the SAT farmer operates.

In INDIA

In preparing for this task, Institute sorghum scientists have assembled an excellent collection of germplasm entries, which have been grown and characterized. They have developed or are developing screening techniques for the identification of resistance to downy mildew, charcoal rot, head mold, several leaf diseases, shoot fly, stem borer, midge, head bug, and the parasitic Striga weed, and are expanding research on resistance to drought and on problems of crop establishment. Research is also underway to develop varieties and hybrids with good food properties. Genetic material of known valuable potential is made available to breeders and other cooperators in national programs as it is developed. An excellent trial network and contacts have been built up throughout the SAT by personal contact, exchange of breeding material and information, and by sponsoring conferences and workshops.

In sorghum breeding, elite agronomic types have been developed in the population breeding program, and by pedigree breeding among good food quality grain and mold-resistant lines. There will be a greater effort to improve elite materials for specific traits located by means of the various screening programs. Breeders are now using the traits for trichomes and glossy plants that were recently found to contribute resistance to shoot fly and seedling drought resistance. Agronomically promising lines with useful levels of resistance to drought, midge, shoot fly, and Striga are recent developments in the program. Promising sorghums for the postrainy season are being developed and some have entered All India Coordinated Sorghum Improvement Program Trials. Hybrid parent identification also is emphasized.

In pathology, the research continues for more effective resistance to grain molds, sorghum downy mildew, charcoal rot, and some leaf diseases. Extensive studies of charcoal rot are planned to enable intensive testing for resistance. Genetic material showing stable resistance to grain mold, downy mildew, rust, and anthracnose is available for incorporation into breeding lines.

Resistance to shoot fly has been developed and is being incorporated into breeding lines. Sources of resistance to stem borer have been identified, using artificial rearing and field infestation techniques. Incorporation of resistance into good breeding stock is underway. Midge screening techniques have greatly improved. A number of lines have repeatedly demonstrated resistance to midge, and one midge-resistant breeding line is being evaluated on farmers' fields in the State of Karnataka, India in 1984.

In microbiology, the field-screening technique for measurement of nitrogenase activity have been improved to support identification and breeding of lines with good nitrogen-fixing ability. Inoculation with nitrogen-fixing bacteria will also be evaluated.

In drought resistance research, Institute physiologists will expand their work on screening methods and also intensify their efforts to evaluate heat and moisture stress, and identify a basis for adaptation of sorghum to postrainy season conditions. A real need in this area is techniques and facilities for screening under well-controlled conditions. Some techniques have been developed that appear to have wide utility in the SAT. A major effort is being developed to study problems related to crop establishment and this is being further investigated with assistance from the Overseas Development Administration of the UK. Little data are available on the interaction of variety with moisture, which has been found to be substantial; breeding materials are being evaluated under conditions of adequate and limited moisture availability.

ICRISAT's sorghum scientists expect to continue their collaboration with Title XII research projects conducted by several universities in the United States. Results of such research efforts should be of direct benefit to sorghum growers in less developed countries.

Since 1976, the Commonwealth Overseas Pest Research Organization has sent one or more scientists to ICRISAT each summer to carry out work on stem borers. This collaboration is providing ICRISAT with more basic information on these insect pests. Collaborative research with CMRI, London on charcoal rot, and Welsh Plant Breeders' Institute on temperature stress is entering an exciting phase. Mechanism of stem borer resistance in collaboration with TDRI (COPR) London, basic Striga research by WRO, Oxford, milling processing and nutrition evaluation in collaboration with Carlsberg Research Center, Copenhagen and Animal Science Institute, Copenhagen are also important collaborative projects with mentor institutions in developed countries.

In WEST AFRICA

It is clear that there are research requirements for Africa that cannot be adequately met by the programs at ICRISAT Center in India. Examples include breeding for resistance to Striga hermonthica, to Busseola stem borer, and to sooty stripe and gray leaf spot. Before breeding material that has been generated in India and elsewhere is used by national programs in Africa, it is desirable to test and evaluate it. For this reason, ICRISAT started establishing a core sorghum program in Africa in 1978.

The interdisciplinary sorghum team in Upper Volta comprises a breeder/team leader, a pathologist (vacant), and a Striga specialist. A position of agronomist has been requested in 1985.

A USAID grant supports in Mali a sorghum breeder and an agronomist, who also work with millet. USAID-SAFGRAD supports a regional sorghum breeder/coordinator in East Africa based in Kenya.

In Upper Volta, the breeder has developed several elite lines and one, E35-1, is expanding on farmers fields. He has organized the second West African regional trials program. The Striga scientist has located good "hot spots" for screening, researched screening problems, the Striga scientist have identified Framida as useful for Striga resistance as well as stand establishment. The variety is currently being used by farmers but good white seeded types are about ready from the Striga breeding program. Field resistance has been identified in some source material. The parasitic weed Striga is a more important problem in Africa than it is in India, and the Institute will do its major Striga work there. The agronomist, core-funded from 1980 to 1982, conducted physiological and agronomic studies with improved sorghum cultivars. He expanded our knowledge about moisture availability in soils with different characteristics and, with the breeder, has identified varieties best suited to different conditions.

In MEXICO and CENTRAL AMERICA

There is a noticeable increase in demand for sorghum as human food in Mexico and Central America, particularly in areas that are marginal for maize production. Considerable potential exists there for small farmers.

An ICRISAT breeder and an agronomist, posted at our sister Institute CIMMYT in Mexico on a special project grant, are currently conducting a research program with high-altitude sorghum. Varieties have also been developed for use at lower elevations and are in increasing use by a network of research programs in Mexico, El Salvador, Nicaragua, Honduras, Guatemala, and Venezuela. One variety is now spreading on farmers fields in Venezuala and two others are moving to farmers in El Salvador. Research has also developed on food quality, resistance to stem borer, and the fall armyworm, and on resistance to leaf diseases and grain mold.

Pearl Millet

Core

Man Years

Principal

	1983	1984	1985	1986	1987	1988
ICRISAT Center	4.25	4.5	5	5	5	5
Africa Core	9	9.5	10	10.5	11	11
TOTAL	13.25	14	15	15.5	16	16

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	12	12	12	12	127.5	127	129	131
Africa Core	-	1	1	1	81	54	56	58.5
Total	12	13	13	13	208.5	181	185	189.5

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 Increase	1986 Prop	1986 Increase	1987 Proj	1988 Proj
2082	2786	2880	94	3050	170	3184	3203

Budget Changes

The program at the Sahelian Center will be strengthened by the addition of an agronomist in 1984.

Program Commentary

Pearl millet, with possibly some of the minor millets, will continue to play a major role in feeding the most underprivileged people of the SAT. Through well-integrated, sharply-focused activities of ICRISAT's Pearl Millet Improvement Program, the expected benefits include: narrowing the yield gap between

experiment stations and farmers' fields by building in stable resistance to stress factors such as drought, diseases, parasitic weeds, and insect pests; improvement in yields under low-fertility conditions through enhancement of biological nitrogen fixation, legume/millet intercropping, and exploitation of fungi associated with millet roots to increase nutrient uptake; and combining increased yield potential with characters of wide adaptability.

The program emphasizes an integrated team approach with ICRISAT Center-based team efforts more oriented toward the development of new concepts, improved methodologies, and improved breeding lines for use by national program scientists. The ICRISAT country-based team members are more directly concerned with the production of finished products and their testing and adoption on farmers' fields.

ICRISAT's Sahelian Center team has greatly increased the Institute's effectiveness in serving African millet improvement activities by testing the applicability of ICRISAT Center-generated technology in the Sahelian situation and making necessary adaptations and, where necessary, generating new techniques and cultivars tailored specifically for some of the unique problems of pearl millet improvement in the Sahel. In this way the country-based staff of ICRISAT, and national program scientists, will be supplied with the materials and methods they need to more rapidly help the farmers served by the national scientists.

In INDIA

Center-based Activities

Problem-solving by interdisciplinary teams will continue. Problem areas that will receive major attention include:

- improvement of screening techniques for drought tolerance and resistance, and evaluation of potentials for selection for these characters in segregating populations.

- improvement of techniques to screen for the capacity to stimulate nitrogen fixation and mycorrhizal symbiosis and evaluation of the potential to improve these capabilities by breeding.

- Utilization of developed ergot resistance, particularly in hybrid parents and production of more materials with multiple resistance to downy mildew, ergot, and smut.

- evaluation of the stability and likely durability of resistance to downy mildew, ergot, smut, and rust.

- substantially raising yield potential through extensive mobilization of new genetic variability from the germplasm to produce new adapted lines and a range of seed parents, which in India are a major constraints on yield improvement of hybrids.

- continued emphasis on population breeding, as a means of obtaining simultaneous improvement for several traits, which has proven a successful approach in pearl millet, and continued production of new varieties.

- characterizing environments to enable classification of adaptation zones, which will make possible prediction of the kinds of cultivars likely to be most useful in a given area.

In AFRICA

Sahelian Center Core Program

The millet team at the Sahelian Center now includes a breeder, plant pathologist, entomologist, and agronomist. The team will test and adapt technology generated at ICRISAT Center, and develop new technology specific to the needs of national programs in Africa, while keeping the Center researchers well supplied with information and material. The Sahelian Center team will have primary responsibility for work on certain insect pests that either do not occur or are not a problem of the Indian subcontinent. Genetic improvement and crop management activities will be well-integrated, and agronomists in both the millet and farming systems teams will emphasize enhancement of soil fertility, soil moisture retention, and integration of livestock needs and potentials. The ICRISAT Sahelian Center will not only greatly increase the Institute's effectiveness in serving the region; it will also provide to other scientists in Africa the type of support that will make all millet improvement programs--local, national, and regional--more effective.

West African Network

A UNDP restricted core project supports millet breeders in Senegal, Upper Volta, Niger (at Maradi), Sudan, and Nigeria. These scientists have responsibility for the development of new varieties for the particular agroeconomic zone in which they are located. They supervise ICRISAT's West African Pearl Millet Adaptation Trials and cooperate very closely with the national scientists of these countries in assisting national on-farm trials, regional trials conducted by CILSS and SAFGRAD, and in training local scientists and technicians.

Pulses

Core

Man Years

Principal

	1983	1984	1985	1986	1987	1988
ICRISAT Center	5	4.5	6	6.5	7	7
Africa Core	2	2	2	2	2	2
Total	7	6.5	8	8.5	9	9

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	19.25	20.5	21.5	22	175	178	184	188
Africa Core	1	1	1	1	4	4	4	4
Total	20.25	21.5	22.5	23	179	182	188	192

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 Increase	1986 Prop	1986 Increase	1987 Proj	1988 Proj
1333	1333	1481	148	1546	65	1615	1620

Budget Changes

ICRISAT's proposal to initiate an Asian legume improvement project has been received with enthusiasm by the countries of the region. We also expect work to be in full swing in Pakistan on chickpea Ascochyta blight. A breeder/pathologist will be posted there in late 1984 under a special project grant from the Asian Development Bank. In India we will do more work on late pigeonpea while continuing to give a high priority to research on short duration pigeonpea. The imbalance that has existed in research on the two crops is being addressed by posting a breeder at Gwalior in northern India to work on late pigeonpea.

Program Commentary

In INDIA

Work will continue on improvements in yield and resistance in plant types used in existing cropping systems, with continued emphasis on constructing new plant types that will be superior performers in future cropping systems. Good progress is being made at our cooperative station at Hissar in developing short-duration, high-yielding, disease-resistant pigeonpeas for which there is a great demand in northern India. Also we have worked out a package of practices to obtain high yields (over 2.5 tons/ha) of short duration pigeonpeas in southern India. The role of pigeonpea in intercropping is receiving major attention at ICRISAT Center and elsewhere.

International cooperation in chickpea breeding work now extends to more than 60 locations in more than 20 countries. Cooperators have been furnished with early generation bulks, advanced generation bulks, and material for uniform cultivar tests. Likewise, nurseries of vegetable-type and grain-type pigeonpea are being coordinated.

We have made considerable progress in generating high-yielding chickpea lines with resistance to wilt and root rots and to Ascochyta blight. Wilt-resistant kabuli chickpeas have been bred for the first time. We have demonstrated that very high yields (over 3 tons/ha) can be obtained in peninsular India through limited irrigations, and this finding has attracted wide attention.

Institute scientists are making good progress towards generating high-yielding pigeonpea material with resistance to wilt, sterility mosaic, and Phytophthora blight, and with tolerance to waterlogging and salinity. Pathologists ad agronomists working together have established that pigeonpea wilt can be effectively reduced through crop rotations and through intercropping pigeonpea with sorghum.

Methods that will help the small SAT farmer deal effectively with pests are sought by the pulse entomologists; they are hopeful that they can identify and exploit integrated pest-management elements that, along with host-plant resistance, will reduce the considerable losses now experienced annually in farmers' fields.

The Max Planck Institute and GTZ are supporting a project on the identification of the chemical basis in host plant resistance of pigeonpea and chickpea to insect pests. Very interesting and useful information is being generated.

Since chickpea grows better in the north Indian environment, the research program at Hissar (29 N) has been strengthened. Similarly, research on late pigeonpea is being intensified at Gwalior (26 N).

Under a special grant from the Ministry of Agriculture, Forestry, and Fisheries of the Government of Japan, a project has been commenced on the development of methods of soil management in relation to cultivation of pigeonpeas and chickpeas in the semi-arid tropics. Two Japanese scientists will work at ICRISAT on this project in 1985.

In WESTERN ASIA

ICRISAT has a fulltime chickpea breeder and a pathologist in West Asia, headquartered in Aleppo at ICARDA, which is working with ICRISAT on chickpea improvement in that region. The team is assisted by ICARDA staff members concentrating on pest control, agronomy, and microbiology. The work has led to the release of several Ascochyta blight-resistant cultivars in countries of the region.

In AFRICA

We have further strengthened our link with pigeonpea workers in Kenya and Malawi. A substantial amount of breeding material, including wilt-resistant lines, has been supplied to these workers.

In SOUTH ASIA

ICRISAT is initiating an Asian Grain Legume Improvement Project, and will appoint a principal staff member as coordinator.

Groundnut

Core

Man Years

Principal

	1983	1984	1985	1986	1987	1988
ICRISAT Center	5	5.5	6	6	7	7
Africa Core	1.5	2	4	4	4	4
Total	6.5	7.5	10	10	11	11

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	14.25	14	15.5	17	160.75	163.5	169.5	173
Africa Core	-	-	-	-	-	5	13	17
Total	14.25	14	15.5	17	160.75	168.5	182.5	190

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 Increase	1986 Prop	1986 Increase	1987 Proj	1988 Proj
1103	1339	1649	310	1706	57	1820	1852

Budget Changes

We expect a considerable shift in emphasis in 1985 from work primarily within India to more extensive groundnut research in Africa and in Asia generally. The breeder-pathologist regional team posted in Malawi has been introducing germplasm and breeding lines that are likely to be of use in 7 of the 9 SADCC countries of southern Africa, and these countries appear interested in building up their national programs. In West Africa, a groundnut improvement team comprising a breeder and a pathologist are provided for the Sahelian Center. (The pathologist would also be

expected to assist the cowpea breeder posted at the Sahelian Center by IITA.) Groundnut will also play a major role in the Asian Grain Legume Improvement program, which ICRISAT initiated and which has been received with enthusiasm by countries of the region.

Program Commentary

In INDIA

Groundnut became the fifth ICRISAT mandate crop in 1976. It is the most important legume crop of the semi-arid tropics, with production equalling the combined total for dry beans and chickpeas, the next two in importance. Groundnut, with 25% protein and 50% oil, is an important food crop in the SAT and, as one of the world's major sources of edible oils, is an important cash crop as well. It is the only ICRISAT crop that enters world trade to any extent. Of world groundnut production, two-thirds is grown in the SAT, most of it on small farms. Yields in the SAT are low, however, averaging around 800 kg/ha compared with 3000 kg/ha or more in developed countries.

The major constraints to production are pests, diseases, and the unreliable rainfall patterns of the SAT. Certain of these pests and diseases are worldwide in distribution and are being studied intensively as part of the ICRISAT research program; breakthroughs to control them will have a broad impact. There are relatively small numbers of groundnut researchers available, and few programs have been mounted to actively breed for resistance to the pests and diseases that annually cause serious reduction in yield. Small farmers of the SAT, who lack the means to control pests and diseases, particularly need resistant material that will allow reasonably stable yields of groundnuts. The main objective of the ICRISAT program is to produce high-yielding breeding lines with resistance to the major factors presently limiting production.

As with other crop improvement programs at ICRISAT, the groundnut program integrates plant breeding, plant pathology, entomology, microbiology, and physiology. In addition, because of the need to utilize wild *Arachis* species as sources of resistance, there is a cytogenetics subprogram consisting of a principal scientist, two national scientists, and support staff. The role of the cytogeneticists is to cross the useful wild species--which have high degrees of resistance to a wide range of fungi, viruses, insects, and nematodes--with the tetraploid cultivated species and provide to the breeders tetraploid material that can be used in conventional breeding programs. The Institute hopes to put more resources into this work for groundnut and other ICRISAT crops in the future.

Because groundnut virus diseases are very serious on a worldwide scale, the pathology subprogram is larger than most other pathology programs at ICRISAT. A principal virologist, a national scientist, and auxiliary staff are included, in addition to scientists who concentrate on the fungal diseases of groundnuts. Valuable cooperative efforts with laboratories in Japan, USA, U.K., West Germany, and other countries will continue.

The entomology subprogram has been enlarged as a result of investigations that show insect pests play a larger role in reducing yield than was thought when the groundnut program was started. The principal staff position of entomologist recommended by the panel that conducted ICRISAT's Quinquennial Review in 1978 was finally funded for 1984.

Considerable progress has been made in locating good sources of resistance to rust in the cultivated groundnut, and a resistance breeding program is well under way. Some of the rust-resistant cultivars also have good resistance to late leaf spot disease. Rust-resistant parents and hybrids have been supplied to many scientists in Africa and Asia.

High-yielding breeding lines for growing seasons of both short and long duration are currently being tested at sites in India and abroad. Several lines outyielded the national checks in their first season of trial.

Good progress is being made in screening the world collection to identify lines tolerant to drought, and a greatly improved understanding of drought effects on groundnuts is being achieved by studies made in cooperation with the University of Nottingham, U.K. The effects of drought on calcium nutrition are also being studied.

The Groundnut Program has benefited since 1980 from the work of several visiting scientists from Japan. Most recently Dr. Kenji Tanaka from the National Food Research Institute, Ministry of Agriculture, Fisheries and Forestry, Japan worked for a year to strengthen our research on mycotoxins and was succeeded by Dr. M. Saito on this project, which ended in December 1983.

In AFRICA

The regional groundnut improvement program for southern and eastern Africa started in 1982 with a breeder and a pathologist based in Malawi. This project was funded by IDRC for a 2-year period with a possible extension for a further 2-year period and has been transfered to restricted core.

A program of work has been formulated for the commencement of groundnut research in West Africa. Emphasis will be concentrated on the production of drought tolerant cultivars suitable to the low rainfall areas of the region and on stable resistance to the main diseases such as leafspots, rust, rosette, and seed and seedling disorders. The production of cultivars suitable for intercropping, particularly with pearl millet, will also be a major area of research. Initially the team will consist of a breeder and a pathologist, who will work in close cooperation with scientists of the Farming Systems Research Program.

Farming Systems

Core

Man Years

Principal

	1983	1984	1985	1986	1987	1988
ICRISAT Center	6	7.5	7.5	8	8.5	8.5
Africa Core	5.25	3.5	3.5	4	4.5	4.5
Total	11.25	11	11	12	13	13

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	17.75	20	22	23	198.5	198.5	204	208
Africa Core	-	-	-		26	10	10	12.5
Total	17.75	20	22	23	224.5	208.5	214	220.5

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 (Decrease)	1986 Prop	1986 Increase	1987 Proj	1988 Proj
1799	2389	1786	(603)	1944	158	2094	2133

Budget Changes

A major change in emphasis--from crop-based research to animal-based research--will occur in 1985 with development of our Farming Systems Research Program at the ICRISAT Sahelian Center. Our scientists there will work in collaboration with ILCA and IITA. There will also be an input on agroforestry in our farming systems research. In India, we will intensify our research on soil conservation through evaluation of agroclimatic and soil factors. This is important in the transfer of our technology for improved management in Vertisols to diverse agroclimatic areas of the SAT.

The farming systems team in the Sahelian Center will be strengthened by the addition of a cropping systems agronomist. This was the most important addition proposed by the review made in 1983 of the Farming Systems research at the Center.

The program for on-farm research and demonstrations of the deep Vertisol technology in India will be phased out in 1985. It is hoped that the Departments of Agriculture in the interested states will continue with the work.

Program Commentary

Farming Systems Research at ICRISAT is a resource-centered program, focused on improvements of resource use and its conservation. It uses a whole-farm approach for developing improved technologies to increase and stabilize agricultural production in the semi-arid tropics. The final products of farming systems research are not only in the form of new technologies but also of principles and methodologies that improve the capacity of national agricultural programs to generate relevant location-specific technologies. It explicitly considers the environmental complexities and constraints to collect information for continued reshaping of research priorities.

Farming systems research starts with base data collection, analyses, and diagnostic research on existing farming systems and ends with an impact assessment of new technologies. It takes place at many locations--at ICRISAT Center, on farmers' fields, and at benchmark locations on national program research stations.

Our research at ICRISAT involves the application of knowledge available from the physical, biological, and social sciences, and uses a systems approach in its enquiry. Thus, it is holistic in outlook and is both multidisciplinary and interdisciplinary. Physical, biological, and socioeconomic scientists work as a team in carrying out this research.

In INDIA

Our principal work in 1983 involved an expansion of on-farm verification trials of our technology for improved management of deep Vertisols in four states of India. This work is being carried out by State Departments of Agriculture in Andhra Pradesh, Karnataka, Madhya Pradesh, and Maharashtra at 28 locations, covering some 2000 hectares and involving 1406 farmers. A workshop on watershed-based dryland farming in black and red soils of peninsular India was held at ICRISAT Center 3-4 October 1983. It was organized jointly by the National Bank for Agriculture and Rural Development, the Indian Council of Agricultural Research, and ICRISAT. Participants discussed field-scale experiences gained in the planning, design, and operation of watershed-based improved technologies. The credit and technical-support aspects were evaluated. The workshop recommended a well-knit, area-specific blend of credit, infrastructure, and extension support for the wider diffusion/transfer of available technologies.

Seminars and training programs were organized by ICRISAT for extension personnel working in the deep Vertisol project areas to facilitate the verification of technology and the dissemination process. A total of 380 man-days of training was provided in 1983.

We also continued efforts to develop better farming systems for Alfisols (red soils). An important finding was that a modified contour-bund system, which includes gated outlet, land smoothing, and planting on grade instead of on contour was most effective in controlling soil and water losses on Alfisols. The system also increased crop yields by 21%, as compared to the original contour-bund system. In November we held an international consultants' workshop at ICRISAT Center to discuss constraints to increased productivity on Alfisols, and to review current knowledge on effective management of these soils under rainfed conditions. The consensus at the Workshop--which attracted participants from Australia, Botswana, Germany, India, Mali, the Netherlands, Niger, Upper Volta, and USA--was that, because of the wide diversity of these soils and agroenvironments, no single strategy was likely to be successful for increased crop productivity. The workshop therefore recommended systematic development and testing of promising management components and combinations at different locations in the SAT.

In AFRICA

With the expansion of the staff at our Sahelian Center, a review meeting on Farming Systems research for West Africa was held at Niamey 10-13 August 1983 to evaluate and prioritize areas of

farming systems research for the Sahelian region, to identify areas of collaborative research, to define the complimentarity of research at different centers within West Africa and with the ICRISAT Center at Patancheru, India, and to formulate a plan for Farming Systems research to guide individual projects over the next few years with emphasis on inter-disciplinary approaches that may achieve rapid results.

It was agreed that Farming Systems work at the Sahelian Center should involve scientists from the Farming Systems, Economics, and Crop Improvement programs. The Research should have a strong bias towards problem-solving. A close working relationship between the scientists working with crop production and animal production systems will be emphasized. It was agreed that in-service training facilities for farming systems research should be developed at the ICRISAT Sahelian Center.

A set of priorities for research were outlined for the farming systems research. These are: soil and water management, plant nutrition, cropping systems, economics studies, farm livestock management, agroforestry, and systems analysis and evaluation. Working groups have been formulated to implement the priority programs of research.

Economics

Core

Man Years						
	Principal					
	1983	1984	1985	1986	1987	1988
ICRISAT Center	1.5	1.5	2	2.5	3	3
Africa Core	3	3	2	2	2	2
Total	4.5	4.5	4	4.5	5	5

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	6.75	7.5	8.5	9	28	28	30	32
Africa Core	1				22	19	19	19
Total	7.75	7.5	8.5	9	50	47	49	51

U.S. $000							
		1985		1986			
1983 Actual	1984 Alloca	Prop	(Decrease)	Prop	Increase	1987 Proj	1988 Proj
768	781	640	(141)	697	57	754	761

Budget Changes

Adoption and performance of improved technologies in SAT agriculture depends to a large extent upon conditions existing in a particular location. We will therefore shift emphasis in 1985 to assess these differences. We have now completed the longitudinal village-level studies started in 1975. Building on our experience with these studies, we will emphasize in 1985 ex-ante evaluation of watershed technologies, such as good water management on Alfisols and small ponds for gravity irrigation on Vertisols, to better determine research priorities for on-farm and on-station experiments.

Program Commentary

In INDIA

The dual objectives of the Economics Program at ICRISAT are the identification of socioeconomic and other constraints to agricultural development in the SAT and the evaluation of alternative means of alleviating these constraints through technological and institutional changes. Initially identification of constraints played a major role in the work of the Economics Program, but in recent years emphasis has shifted towards evaluation of technologies and institutions.

With the progress in ICRISAT's technology development by crop improvement and farming systems research programs, the evaluation of technologies in farmers' fields and the assessment of their economic impact at the farm, national, and global levels have become increasingly important. For example, the economic assessment of on-farm verification trials of the Vertisol technology, which are being conducted in collaboration with the FSRP in a number of locations of India, provides information to researchers and policy makers about the level and variability of returns of this technology, and thereby orients future research and extension activities.

Whole farm modeling of representative farm types is another effort through which a deeper understanding is being gained of the roles of such constraints to adoption as labor, credit, costs of inputs, and risk. The model explains, for instance, the observation made in the field that adoption of the Vertisol technology is less rapid in regions with irrigation because of competing demand for female workers in more remunerative irrigated tracts.

Simulation modeling by the Economics Program provides yet another way of assessing the impact of ICRISAT's improved technologies at the national and even global levels. Such models allow us to analyze and assess the effects of changes such as increased supplies of coarse grains. First results indicate that with an increase in the production of sorghum and millets, and keeping other things constant, high income elasticities of demand for these coarse grains in the lowest income groups will more than offset the negative elasticities observed in the much smaller higher income groups. The result is an absolute increase in demand for coarse grains.

New technologies have different rates and levels of adoption, depending not only on profitability and riskiness of the technology to be adopted but also on other factors such as access to the technology and performance of the input delivery system. By studying the past patterns and ceiling rates of

adoption of earlier improvements in sorghum and pearl millets, important insights are gained which may help to increase the rates of adoption of other improved technologies.

Institutional investments are required to complement and enhance the effects of technological change. Our research on the effect of improving farmers' access to agricultural markets on productivity and input use has brought to light the importance of efficient market channels for improving farmers' resource allocation. Market policies that generate efficiency in interregional trade and give farmers better access to roads and markets increase aggregate productivity. As the network of markets and roads improves large farmers are gaining more initially, but with further improvements the gains go increasingly in favor of smaller farmers.

Crop insurance is being seen by many as a possible measure to alleviate weather risks for the SAT farmer. Work is underway in the Economics Program to assess the possibilities and limitations of such an institutional investment.

The study of the behavior of the farm household as a unit of production and consumption is receiving increasing attention in the work of the Economics Program. In earlier studies, risk, labor, nutrition, fertilizer use, etc. were analyzed separately and provided only a partial perspective. With the completion of 10 years of uninterrupted data collection in the village studies a unique set of time series data has been accumulated which lends itself to comprehensive analyses of the simultaneous interplay of production relations between human and natural resources in interaction with technological and institutional inputs.

Common property resources have been found to be an important source of income for farmers in the SAT. The need is obvious for improved management systems of such commonly owned resources as wastelands, grazing lands, riverbeds, forests, groundwater et. Work is underway in the Economics Program to address this issue.

In 1984 we are undertaking a project funded by the German Association for Technical Aid (GTZ) on "Composite Watershed Management of Alfisols in India". This project aims at the development of a systematic water management approach for groundwater recharge through run-off control and irrigation from wells in combination with or replacement of traditional tank irrigation systems.

Training assumes an increasingly important role in the work of the Economics Program. Apart from students working as research scholars and fellows on long term research projects of the Economics Program, other economists are being invited for a short-term course to be held once a year on methodologies of

technology assessment, conduct of long-term village studies, and other methodologies developed in the Economics Program.

In AFRICA

While the various SAT areas of the world are similar in some basic climatic features there are many region specific differences. An understanding of the location specific particularities across the SAT is vital if small farmers with limited means throughout the SAT are to be served. For this reason, activities of the Economics Program during the initial years in Africa will be devoted to the accumulation and analysis of basic data specific to the African SAT situation--including village-level studies and projects similar to those now under way or completed in India.

Baseline data are being collected in village studies from 10 villages selected in Upper Volta and Niger representative of the Sahelian Savana and northern and southern Sudanian Savanas. These data comprise not only diagnostic information on traditional practices but also results of on-farm technology test programs.

IDRC provided ICRISAT a special grant of $450,300 for a Rural Economics Project in West Africa from 1 April 1980 to 30 March 1982. Due to delays in recruiting a social-anthropologist included in the project, the period was extended without additional funding until 30 June 1983. A subsequent extension with supplemental funding enabled the project to continue throughout 1984, in order to complete elements of the original objectives. A proposal for a special project grant to continue the IDRC/ICRISAT West Africa Rural Economics Project has been submitted to IDRC.

B. Research Support Activities

Office of the Director of Research

Core

Man Years

Principal

1983	1984	1985	1986	1987	1988
2	2	2	2.5	3	3

Sci/Supv.				Other Support Staff			
1983	1984	1985	1986	1983	1984	1985	1986
2	3	4	4	3.25	4	4.5	5

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 Increase	1986 Prop	1986 Increase	1987 Proj	1988 Proj
203	251	277	26	320	43	362	362

Program Commentary

The Director of Research coordinates the total research effort of the Institute. He has management and supervisory responsibility of the research and the research support activities at ICRISAT Center and throughout India. He formulates and implements the annual program of research to meet the objectives of the Institute. He supervises the programs of research in Sorghum, Millets, Pulses, Groundnut, Farming Systems, Economics and the research support programs of Genetic Resources, Biochemistry, Farm Development and Operations, Computer and Statistical Services, Plant Quarantine and the Library. He is responsible for scientific liaison with cooperating research agencies in India and arranges for consultants and other specialists to visit ICRISAT. He also coordinates core research activities with the International Cooperative research programs and takes responsibility for reviewing the research programs to maintain

quality, cost-effectiveness, relevance, and excellence of research.

The Statistical Services Unit at ICRISAT, which is under the Director of Research, provides a consultancy service to scientists on designing and analyzing experiments, and on the use of the Institute's statistical computer software. The unit also develops new statistical procedures resulting from consultations with scientists.

Plant Quarantine Unit

Core

Man Years					
Principal					
1983	1984	1985	1986	1987	1988
-	-	-	-	-	-

Sci/Supv.				Other Support Staff			
1983	1984	1985	1986	1983	1984	1985	1986
3	3	3	3	11	12	12	12

U.S. $000							
		1985		1986			
1983 Actual	1984 Alloca	Prop	(Decrease)	Prop	Increase	1987 Proj	1988 Proj
65	82	71	(11)	71	-	71	71

Budget Changes

The proposed budget for 1985 will permit a continuation of work at present levels for this important unit, which was established in 1974 as a separate unit at ICRISAT Center with the cooperation of the Government of India.

Program Commentary

The work of quarantine clearance of incoming seed material is carried out at the Central Plant Protection Training Institute of the Government of India in Hyderabad. By December 1983, 134 023 samples had been cleared since 1974. All the released seed material is grown for the first generation in the Post-Entry Quarantine Isolation Area at ICRISAT Center, where it is regularly inspected twice a week by the Government of India quarantine officers and ICRISAT scientists.

For export of seed material, ICRISAT operates an Export Certification Quarantine Labaratory that has cut down the quarantine clearance period from 5 weeks to 1 week. So far, 496 017 seed samples have been exported to 125 countries since 1974, and most of them were cleared in this laboratory.

Besides maintaining a close liaison with the Government of India's Directorate of Plant Protection, Quarantine and Storage, and the National Bureau of Plant Genetic Resources, ICRISAT is developing contacts with the plant quarantine authorities of the countries that receive our seed material to ensure smooth and quick movement of the material.

In Niger, FAO is funding the establishment of a quarantine unit at the Tarna Research Station. As activities increase at ICRISAT's Sahelian Center, the movement of material into and out of the Center is expected to increase. Restrictions are not now being imposed, but it is anticipated that, in time, they will be instituted by the authorities.

Genetic Resources Unit

Core

Man Years					
Principal					
1983	1984	1985	1986	1987	1988
2	2	2	2	2	2

Sci/Supv.				Other Support Staff			
1983	1984	1985	1986	1983	1984	1985	1986
5	5	5	5	80	79	80	81

U.S. $000							
		1985		1986			
1983 Actual	1984 Alloca	Prop	(Decrease)	Prop	Increase	1987 Proj	1988 Proj
385	395	383	(12)	388	5	408	428

Budget Changes

The Genetic Resources Unit became operational in January 1979. Presently it has two principal scientists, five other scientists, and support staff.

The germplasm collection will be accelerated at local and international levels in accordance with the already identified priority collection areas. More funds are required to urgently collect and conserve the vanishing germplasm. The need for evaluation of germplasm at or near their original habitat is now felt more and it needs additional funding requirement.

Program Commentary

The main objectives of the Unit are the collection, assembly, maintenance, evaluation, utilization, conservation, documentation, and distribution of all the Institute's mandate crops and six minor millets. ICRISAT's mandate also includes

serving as a major repository of the world's germplasm collection of the same crops. Construction of a long-term seed-storage facility is progressing well. The ancillary laboratory where the viability and general condition of the stored germplasm is being monitored is now fully operational.

All of the germplasm collections of the Institute are now handled and maintained by the Genetic Resources Unit. The previously assembled material and recent collections exceed 76,000 accessions for all the crops.

The Unit is continuing an aggressive germplasm collection program. In 1982, and 1983, ICRISAT germplasm botanists collected in Kenya, Malawi, Nigeria, Ethiopia, Sudan, Sierra Leone, Cameroun and different regions of India. The newly collected samples from different parts of the world are properly evaluated and maintained. The systematic screening of the germplasm is providing new and important sources of resistance to diseases, insects, and other environmental stresses. Thousands of germplasm samples are distributed throughout the world. A high level of cooperation exists between national programs and other organizations with ICRISAT.

The newly identified priority areas of collection in Africa, Southeast Asia, South America and the Carribean Islands will be further explored and germplasm collected in collaboration with the International Board for Plant Genetic Resources (IBPGR) and national organizations in those areas. Consultations with the Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM) scientists have indicated the need for multilocational evaluation of germplasm in Africa, at or near their original place of collection and diversity. A pilot project on multilocation evaluation of pearl millet germplasm was conducted in 1981 in Upper Volta, Niger and India. The project will be continued with emphasis on germplasm evaluation at or near the original collection place or region. Preliminary result of this pilot project strongly supports the idea of germplasm evaluation in or near its place of origin.

Biochemistry

Core

Man Years					
Principal					
1983	1984	1985	1986	1987	1988
1	1	1	1	1	1

Sci/Supv.				Other Support Staff			
1983	1984	1985	1986	1983	1984	1985	1986
3	4	4	4	25	23	24	25

U.S. $000							
		1985		1986			
1983 Actual	1984 Alloca	Prop	(Decrease)	Prop	Increase	1987 Proj	1988 Proj
177	218	187	(31)	194	7	194	194

Program Commentary

When selecting plant materials for use in developing superior hybrids or varieties for SAT farmers, grain quality must be considered along with yield and resistance to stress. Biochemistry performs rapid screening of germplasm accessions and breeding materials of all ICRISAT crops for protein content and quality. Preliminary experiments have been conducted to determine the levels of polyphenolic compounds, toxins, nitrogen fractions, and soluble sugar in sorghum, millets, chickpeas, and pigeonpeas to identify factors that affect quality and resistance to diseases and pests.

Isolation and identification of chemical compounds that inferfere with the behavior of the podborer *Heliothis armigera*, either as host attractant or deterrent in pigeonpea, is being studied. Likewise, studies on exudation of malic acid from chickpea leaves--made in collaboration with the Max Planck Institute of Biochemistry at Munich--show that this exudate may

be associated with a degree of resistance to *Heliothis*. These studies are continuing and may lead to a technique for rapid screening of genotypes for various desirable traits.

Changes in embryonic protein synthesis are being measured for identifying sorghum and pearl millet suited to high temperature environments.

A rapid procedure has been developed to estimate groundnut oil content without having to destroy the seed. Priorities for the immediate future include increasing our understanding of some of the physicochemical characteristics of the grains and their possible relationship to the cooking quality of cereals and pulses. Studies of the bioavailability of nutrients and some of the antinutritional factors and their role in nutrition are areas where additional information would be very useful.

Farm Development Operations

Core

Man Years

Principal

	1983	1984	1985	1986	1987	1988
ICRISAT Center	1	1	1	1	1	1
Africa Core	-	0.5	1	1	1	1
Total	1	1.5	2	2	2	2

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	6	7	8	9	190	186.5	191.5	194
Africa Core	-	-	-	-	-	12	12	12
Total	6	7	8	9	190	198.5	203.5	206

U.S. $000

1983	1984	1985		1986		1987	1988
Actual	Alloca	Prop	Increase	Prop	Increase	Proj	Proj
1246	935	1096	161	1140	44	1175	1181

Budget Changes

A principal farm manager took up appointment at the ICRISAT Sahelian Center from mid-1984 to assist with research farm development and to insure effective support for field research activities. At ICRISAT Center a major program of replacing field equipment was undertaken in late 1983. Much of the equipment replaced was U.S. Government surplus and had been in use at ICRISAT for more than 10 years. Its replacement should greatly improve the efficiency of our farm operations and reduce maintenance costs in 1984. A modest plan of replacements should,

of course, ensure that ICRISAT is able to maintain the standards of service required.

Program Commentary

The Farm Development and Operation unit provides support for all research activities on the farm at ICRISAT Center and at five cooperative stations in India where ICRISAT researchers work. The Farm Research Committee, chaired by the Director of Research, effectively matches the demands of research programs to available resources. This has led to a steady improvement in field experiment precision and quality of the research support, and ensures that experiments are conducted so that the objectives of the research are achieved.

All farm operations such as primary and secondary tillage, planting, fertilizer application, irrigation, weeding, plant protection, harvesting, threshing, and drying of the farm produce are done by this unit. To make the ICRISAT technology relevant to the small farmers of the SAT, the unit ensures that undue use of pesticides and fertilizers is avoided and sound crop husbandry is practiced. In the precision fields, which are used for crop improvement work, irrigation is used to save valuable material and to see the potential of the crop, but in the arable fields, the emphasis is on moisture conservation and timely operations for successful cultivation of the crops under rainfall conditions comparable to farmers' fields.

In addition to performing the field work in research areas, Farm Development and Operations has responsibility for care and maintenance of roads, waterways, tanks, fences, wells, and other noncropping areas of the Center. Nearly 100 kilometers of roads provide access to the various fields and areas.

As well as its work at ICRISAT Center, the unit has responsibilities connected with the development of research facilities at five cooperative stations in India under ICRISAT's use. These five cooperative stations extend the work into environments different from Hyderabad, an activity important in the development of the ICRISAT mandate crops.

The major problem of funding is for the replacement of worn out field equipment and farm machinery, much of it purchased during 1973-75, from U.S. Government surplus stocks. To distribute the financial load over a period of years, a schedule of replacement was worked out to take effect from 1980 which, due to lack of funds, could not be implemented. This has added to the cost by adding more equipment due for replacement and escalation in prices.

Additional funds have been requested to meet increasing need of herbicide use to control perennial weeds. We also envisage expenditure on desilting of lakes and tanks which over the years have accumulated silt, reducing their storage capacity.

Library and Documentation Services

Core

Man Years					
Principal					
	1983	1984	1985	1986	1987	1988
ICRISAT Center	-	-	-	-	-	-

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	3	4	4	4	24	23.5	25	26

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 (Decrease)	1986 Prop	1986 Increase	1987 Proj	1988 Proj
227	343	287	(56)	295	8	327	347

Budget Changes

The Library has reached a steady state of growth and may be said to have developed a predictable acquisitions policy. The budget for 1985-86 reflects increases to compensate for the inflationary tendencies and inevitable increases in the costs of books and journal subscriptions. Plans for the increased utilization of in-house computer facilities for information storage, retrieval, and dissemination are being worked out. In addition, for the benefit of ICRISAT and other scientists it is proposed to access such information retrieval systems as DIALOG and ORBIT in an online mode, using the international telex network or a

computer-based messaging service. The increase in the budget proposals is to provide for the costs of on-line literature searches as well as for the acquisition of suitable information retrieval software for in-house use.

Program Commentary

The Library now has approximately 19,000 books and reports and over 11,000 bound volumes of periodicals. Efforts are being made to increase the input of nearprint material containing useful experiential information from field sites in SAT countries through personal contacts and exchange programs.

A Central Reprographic Unit (CRU) was set up in the Library in July 1980, to cater to the reprographic needs (photocopy, mimeograph, and near-print) of ICRISAT. The equipment in the Unit consists of 3 photo-copiers, 2 electronic stencil scanners and duplicating machines, and a Ricoh offset copier. The average monthly output of the Unit is 100,000 pages of photocopies and 250,000 pages of mimeograph/offset copies. All the program level reports and most of the seminar papers are now being printed in the CRU.

Phase II of the SMIC (Sorghum and Millets Information Center) Project, started in April 1982, entered its 3rd year in April 1984. During the period April 1982-February 1984 sorghum and millets bibliographies compiled during Phase I were published and distributed widely all over the world. The Directory of sorghum and millets research workers was also published in May 1982. On-demand bibliographies on 57 subjects were compiled by SMIC staff, including a comprehensive bibliography on mycorrhiza. A comprehensive bibliography on agroclimatology was compiled for an international seminar held at ICRISAT. A state-of-the-art review on Soil fertility and fertilizer use on sorghum in India was also produced as part of the SMIC Project.

Additionally, annual annotated bibliographies on sorghum and millet for the period 1981 have been compiled in Phase II. They will be released for publication during 1984.

Efforts to utilize in-house computer facilities for the creation and maintenance of the bibliographic database of information collected by SMIC staff will be made during 1984-85. Efforts to utilize available computer-readable databases for the benefit of sorghum and millets research workers will also be made.

The selective dissemination of information (SDI) service has been broadened to include more nonICRISAT scientists.

The SMIC Newsletter in English and French, published three times yearly, is distributed to 1200 addresses all over the world.

Information Services

Core

Man Years						
	Principal					
	1983	1984	1985	1986	1987	1988
ICRISAT Center	4	3	3	3	3	3
Africa Core	-	1	1	1	1	1
TOTAL	4	4	4	4	4	4

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	6.5	8.5	9	9	23	23.5	25	26
Africa Core	-	-	-	-	-	1	1	1
TOTAL	6.5	8.5	9	9	23	24.5	26	27

U.S. $000

1983	1984	1985		1986		1987	1988
Actual	Alloca	Prop	Increase	Prop	Increase	Proj	Proj
434	553	556	3	558	2	569	581

Program Commentary

Information Services is responsible for the publication and dissemination of information about our research to a wide audience of national scientists and policy makers in developing

countries, the international scientific community, donors, and interested public. In addition, the division provides support services to scientists in preparation of tables, figures, posters, photos, and slides, and in editing journal articles, conference papers, and other materials for presentation outside ICRISAT.

In 1983 Information Services edited and printed 46 institute-level publications including the annual report, research highlights (also published yearly), specialized information bulletins such as disease and insect identification books, research bulletins, workshop proceedings, bibliographies, newsletters, and miscellaneous brochures and pamphlets. Ten of these publications were in French. We also publish a few sorghum publications in Spanish for the benefit of our Latin American clients. Most of the printing is done at ICRISAT Center where we can maintain quality control over reproduction of scientific illustrations, both in color and in black and white, and of the overall publication.

In 1984 we continued adding to the French-language capability the unit has acquired. The French-language editor has been posted at the Sahelian Center temporarily in order to intensify these efforts, and a second fulltime national staff French translator was added to the staff at ICRISAT Center.

We also have begun producing more materials suitable for use by extension staff in national programs and for copublication in local languages in developing countries. This is a natural progression in publishing trends as ICRISAT's technology is increasingly transferred to farmers' fields. The first in this series of extension-level publications is a fully illustrated operator's manual for the wheeled tool carrier, which is vital equipment in implementing the deep Vertisol technology.

Computer Services

Core

Man Years

Principal

	1983	1984	1985	1986	1987	1988
ICRISAT Center	1	1	1	1	1	1

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	3	3.5	4.5	5	10	10	10.5	11

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 Increase	1986 Prop	1986 Increase	1987 Proj	1988 Proj
204	201	247	46	252	5	260	265

Budget Changes

The proposed budget for 1985 reflects the need for additional supplies arising out of the continuing growth in the use of computer facilities at ICRISAT. This increased use of the computer system has caused a four-fold increase in the consumption of supplies, and the addition of terminals has increased the need for spare parts.

Program Commentary

An additional 37 video terminals were added to the VAX-11/780 computer system in 1983, thus providing at least one terminal for nearly every subprogram in ICRISAT. Eight printing terminals were added as remote printers in the laboratory buildings, thus permitting decentralization of printing services.

Extensive use has been made of the powerful GENSTAT statistical package over the past 2 years, permitting scientists to perform analysis previously not available with our locally developed statistical software.

The Economists have been able to analyze their data more completely using the SHAZAM econometric analysis package, and to perform modeling using the MINOS linear programming package.

Additionally, there has been greatly increased use of the word processing capabilities on the computer system to the point where nearly every major ICRISAT publication and all research papers are prepared with computer assistance. An interface between the computer and the phototypesetter permits direct transfer of documents from computer to typesetter.

Administrative applications such as payroll, work order management, and petrol consumption records have been completed. The remaining applications are scheduled for 1984. A second VAX computer, a VAX-11/750 is being purchased in 1984 to be dedicated to administrative applications. This will permit complete segregation of the administrative applications from the research applications as well as providing additional security for sensitive data.

Microcomputer systems for direct data capture in the field and for word processing applications are also being purchased in 1984. The direct data capture will permit more timely data analysis and will eliminate errors generated by manual data entry operations. Microcomputer-based word processing systems will complement the facilities available on the main computer system and in many cases permit a redistribution of the word processing workload. Many departments are also purchasing letter-quality printers to be used in conjunction with their microcomputers and word processing systems.

ICRISAT staff members have increased their use of computers significantly in the past two years and consequently have increased their dependence on the availability of computer services. Each of the computer systems will be used as a backup of the other in case of failure, and thus provides a means for increasing the probability of uninterrupted computer services.

C. International Cooperation

Office of the Director for International Cooperation

Core

Man Years					
Principal					
1983	1984	1985	1986	1987	1988
2	2	3	3	3	3

Sci/Supv.				Other Support Staff			
1983	1984	1985	1986	1983	1984	1985	1986
3	3	3	3	4.5	4.5	6	7

U.S. $000							
		1985		1986			
1983 Actual	1984 Alloca	Prop	Increase	Prop	Increase	1987 Proj	1988 Proj
265	258	453	195	471	18	471	471

Budget Changes

The proposed level of funding reflects the growth of ICRISAT's program of cooperation in many areas of the SAT. A post of Director ICRISAT Sahelian Center and Assistant Director for International Cooperation has been proposed for 1985 in the office of the Director for International Cooperation.

Program Commentary

ICRISAT's research programs are expanding at both Hyderabad headquarters and in the countries of the SAT. Results and seed material are being generated that can be utilized to further the overall objectives of the Institute, which include increasing production of the ICRISAT mandate crops. Efficient means of transferring the information generated and ensuring adequate

exchange of ideas is vital and demands concerted effort. The staffing levels proposed will assist with this in two very important areas.

The Director for International Cooperation is responsible for coordination of ICRISAT's joint efforts with other countries, with international funding and research agencies, and with client state national research programs. The office provides administrative support for all ICRISAT scientists not stationed in India; scientists are in residence in Mali, Niger, Nigeria, Mexico, Syria, Senegal, Sudan, Upper Volta, Kenya, Malawi, and Zimbabwe. The development of the ICRISAT Sahelian Center will expand the work of the office considerably. The Director will be increasingly involved in liaison with governments not currently in formal contact with ICRISAT in view of the increasing number of requests for assistance that are being received from countries as ICRISAT's program becomes more widely appreciated.

The Fellowships and Training Program, which is growing rapidly, is also administered by this office. These activities are very important in the process of transfer of viable technologies to the farmers of the SAT.

Other continuing and important functions of the office include the planning and supervision of conferences and symposia, and making arrangements for the many thousands of visitors the Center receives from abroad and within India through the Visitors Service.

An administrative officer is in position in Niamey, who will be responsible for providing administrative backstopping from the Sahelian Center for our programs in West Africa. An information officer, under the supervision of the Head of the Information Services at ICRISAT Center, has also joined the team temporarily. He will disseminate more efficiently ICRISAT's French publications in this francophone region and thus help improve ICRISAT's image in the region.

Fellowships and Training

Core

Man Years

Principal

	1983	1984	1985	1986	1987	1988
ICRISAT Center	1	1	1	1	1	1

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	4.5	5.5	6	6	10.5	11	12	13

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 Increase	1986 Prop	1986 Increase	1987 Proj	1988 Proj
290	309	483	174	486	3	486	486

Budget Changes

Growth of ICRISAT training programs under the long-term policy approved by the Governing Board will occur in 1985. Outside donors are supporting more and more of the trainees. The UNDP support for the West African Sorghum and Millet Improvement Program and UNDP core funds for Sorghum and Millet are funding trainees. Occupation of the new facilities at ICRISAT Center in 1979 provided an increase in trainee housing. The completion of the Phase II buildings provided additional office, classroom, and work space. These programs offer ICRISAT one of the most effective means of transferring its technology to countries of the SAT.

Program Commentary

The Fellowships and Training unit has six types of programs:

1. In-service training, for 6 to 8 months, offers young scientific and extension workers of the SAT an opportunity to

learn first hand the practical applications of skills for crop improvement, crop production, and farming systems. In 1983, 74 persons from 26 countries completed this program.

2. In-service fellow program, for 1 to 6 months, for persons employed in a senior position by a country program which is related to our mandate. They would study and develop skills by working with the related on-going research program(s) and would be expected to return to their employer's research and development programs. In 1983, 12 persons completed 53 man weeks of training.

3. The research scholars program is for university students who have completed their course work in a cooperating university and who come to ICRISAT for their thesis or dissertation preparation with the counsel of ICRISAT scientists. There were 22 who completed this program in 1983 and 15 are continuing their research programs.

4. Research fellows are M.Sc and Ph.D degree holders from SAT countries who work with ICRISAT scientists on specific research problems for a period of 1 year or more. There were 3 who completed this program in 1983, and 5 are continuing their research.

5. International interns are recent recipients of Ph.D degrees from agricultural universities in donor countries. They come to ICRISAT to work with research scientists on selected problems facing agriculture in the rainfed semi-arid tropics. There were 4 scientists who completed ICRISAT research programs--3 are continuing at ICRISAT Center and one in Mali.

6. Apprentice training is provided to a limited number of agricultural students for a 1 to 2-month period of work study experience with research scientists.

Since 1974, 791 persons from 66 countries have completed one of the training programs. Several of these are now managing research stations or conducting extension programs in SAT countries.

Conferences and Symposia

Core

Man Years					
Principal					
1983	1984	1985	1986	1987	1988
-	-	-	-	-	-

Sci/Supv.				Other Support Staff			
1983	1984	1985	1986	1983	1984	1985	1986
-	-	-	-	-	-	-	-

U.S. $000							
		1985		1986			
1983 Actual	1984 Alloca	Prop	Increase	Prop	Increase	1987 Proj	1988 Proj
235	258	432	174	432	-	432	432

Program Commentary

The ICRISAT research programs, both at the Hyderabad headquarters and at cooperating centers, are producing valuable information of importance to national programs. Problems that can be solved in collaboration with developed country researchers and other research organizations in the SAT are being highlighted as work proceeds. It is vital that a rapid, full and frank exchange of information and dialogue among research workers be maintained and indeed increased.

In 1984, meetings are scheduled on land and water management systems for Alfisols and Vertisols, sorghum insect pests (in collaboration with INTSORMIL), groundnut rust, and consultants' group discussions on adaptation and stress physiology in chickpea and pigeonpea. Our millet improvement and farming systems programs at the Sahelian Center will sponsor regional workshops. A groundnut workshop will be held in Malawi. Such symposia and conferences support our effort at bringing in national program scientists to select genetic material and learn new techniques by contact with ICRISAT scientists.

D. General Administration

Core

Man Years

Principal

	1983	1984	1985	1986	1987	1988
ICRISAT Center	3.75	4	4	4	4	4
Africa Core	1	1	1	2	3	3
Total	4.75	5	5	6	7	7

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	20	24	27.5	29	229.25	256.5	275.5	282
Africa Core	4	2	2	6.5	34	46	46	56.5
Total	24	26	29.5	35.5	263.25	302.5	321.5	338.5

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 Increase	1986 Prop	1986 Increase	1987 Proj	1988 Proj
1472	1647	1686	39	1995	309	2194	2229

Program Commentary

These funds provide for the general administration of the Institute and include such operations as the medical unit, staff welfare, and the traditional services of fiscal, purchase and supplies, personnel, security, travel, communications, etc. Administrative services have declined in recent years inspite of the growth in Institute programs. Internal Audit Unit proposed several times has not been initiated. This can no longer be delayed and it is included in the 1985 Budget request along with other funds for administrative strengthening.

A Training Officer and a Head, Physical Plant Services have been proposed for 1986.

E. General Operations

Transportation Motor Pool

Core

Man Years					
Principal					
1983	1984	1985	1986	1987	1988
-	-	-	-	-	-

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	0.25	3	3	3	55	56.5	60	60

U.S. $000							
		1985		1986			
1983 Actual	1984 Alloca	Prop	(Decrease)	Prop	Increase	1987 Proj	1988 Proj
339	370	308	(62)	320	12	320	320

Program Commentary

ICRISAT will continue to practice strict economy measures in meeting the Institute's transportation needs. ICRISAT was able to adhere to the vehicle replacement schedule to the desired level by the end of 1983 so that the maintenance costs are within the projected limits.

Physical Plant Services

Core

Man Years

Principal

	1983	1984	1985	1986	1987	1988
ICRISAT Center	1	1	1	1	1	1

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	13	16	16	16	250	256	267	275

U.S. $000

1983 Actual	1984 Alloca	1985 Prop	1985 (Decrease)	1986 Prop	1986 Increase	1987 Proj	1988 Proj
894	959	924	(35)	956	32	979	999

Phase II construction is now completed and the new buildings have been occupied. Modifications to Phase I laboratories were undertaken in late 1983 and are expected to be completed by mid-1984. Numerous modifications and changes to existing buildings to provide additional facilities are planned during 1984. Most of these jobs were proposed during 1983, but could not be undertaken due to lack of funds and limited manpower. The staff requirement for maintenance of these additional buildings and facilities has been reflected in the budget proposals. The additional equipment requirement for various programs will result in an increase in the spare parts inventory, special tools and other items needed to keep the new and the existing equipment in operation. Additional funds will therefore be required. Because most of ICRISAT's equipment has been in service for several years, the Phase I buildings and equipment will require additional maintenance in the coming years. For these reasons, additional funds are proposed in the coming years. The approved staffing for 1983 was at par with the 1982 level though the requirements were more. This constraint has affected the support we can give to the research programs. We have reflected the 1983

additional requirement in 1984, assuming this will be approved for 1984. Additional funds for 1985 and onwards should be marginal, provided research programs do not expand their activities.

Housing and Food Services

Core

Man Years					
Principal					
	1983	1984	1985	1986	1987	1988
ICRISAT Center	1	1	1	1	1	1

	Sci/Supv.				Other Support Staff			
	1983	1984	1985	1986	1983	1984	1985	1986
ICRISAT Center	3	3	3	3	131.25	130.5	148.5	159

U.S. $000							
		1985		1986			
1983 Actual	1984 Alloca	Prop	Increase	Prop	Decrease	1987 Proj	1988 Proj
318	232	307	75	296	(11)	296	296

The Housing and Food Services Unit commenced operations in May 1979. It is headed by a principal staff member.

The Food Services Unit operates from four kitchens and dining areas, and serves approximately 1100 meals daily. It also serves 1200 cups of tea in the morning and afternoon, plus catering to all special functions, meetings, seminars and workshops held at ICRISAT.

The Housing Unit operates 128 dormitory rooms, 16 flatlets, 20 essential staff houses, 20 support staff apartments, and 12 principal staff houses at the site, as well as 35 leased principal staff houses, a 6 room guesthouse and a warehouse in Hyderabad.

General Expenses

The amount estimated as being needed for General Expenses during 1985 and 1986 follows ($000):

	1985	1986
Communications	184	184
Office occupancy	1217	1503
Insurance	58	58
General Supplies	155	155
Total:	1614	1900

IX. Major Special Projects

Sorghum

A special project for strengthening sorghum and millet research in Mali is funded by USAID. The project has focused on three primary objectives: (1) development of the research station, (2) training of national staff, both on the job and academically, and (3) improvement of sorghum and millet by breeding and agronomic work. Under this project, in addition to the formal training that several Malians have received, Malian scientists working with the ICRISAT Project have gained considerable experience in plant breeding methodology, laying out of multi-locational experiments, associated data-processing, and preparation of reports--essential competence to carry out good research.

After 5 years of construction activity, the Cinzana Research Station was inaugurated in July, 1982. Buildings are in position, with a piped supply of water and electrical installations. The farm land is ready for experimentation. The breeding program is developing new varieties, hybrids, and populations based on an earlier evaluation of germplasm collections and breeding stock. Tests have been developed to assess food quality of grain, drought stress, temperature stress, and crop establishment capability of cultivars.

The second research component of the project has been agronomic work. Several key areas have been under study for the past several years: (1) Intercropping (2) Population density effects (3) Fertilizer trials. Both cereal/cereal intercropping and cereal/legume intercropping have been studied to find the optimum combinations of cultivar types, planting times and densities, and fertilizer use. Many insights have been gained to improve the popular local practice of intercropping. Telemsi Rock Phosphate, which is locally available, has been tested to

determine its suitability under local farming conditions. Use of animal traction equipment has also been a further facet of study of the agronomist.

A sorghum and millet coordinator for eastern and southern Africa is posted at Nairobi with support from USAID-SAFGRAD. A project for a regional sorghum and pearl millet research and training program for southern Africa (SADCC countries), supported by USAID funds, began in 1984. The project is funded for 5 years in its first phase. In the first year of operation, the team consists of a project manager, a sorghum breeder, an administrative officer, and a farm development specialist. In the second and subsequent years, this team will be augmented by a millet breeder, a pathologist, an entomologist, an agronomist, and an economist.

Pearl Millet

The Overseas Development Administration (ODA) is supporting five ICRISAT projects in collaboration with UK institutions: the Plant Breeding Institute, Cambridge is determining the role of abcisic acid in mediating the response of tropical grain crops to drought, in association with the pearl millet drought resistance project; the University of Reading is studying pathogenic variation of downy mildew of pearl millet; Imperial College, London is investigating the pathway of ergot infection; and Rothamstead Experimental Station in UK, by using 15N2, is quantifying the amount of nitrogen taken up by sorghum and millet as a result of bacterial root symbiosis. The University of Dundee is studying the biology of the symbiosis between fungi (mycorrhiza) from India and Africa and roots of mandate crops.

Collaboration with scientists in the eight U.S. universities involved in INTSORMIL is growing. Seed and information exchange has proved valuable to both collaborators. As INTSORMIL commences projects in countries in Africa where ICRISAT is active, futher opportunities for a joint research will arise.

(For the new special project on millet in southern Africa see commentary under sorghum on page 42.)

Pulses

ODA has been supporting a project that is examining genetic variations in growth and development responses of chickpea to the aerial environment. Some results of the project have been confirmed under field conditions at ICRISAT Center.

Studies on chemical basis of resistance to Heliothis in pigeonpea and chickpea with Max Plank Institute, Germany, Heliothis pheromone studies with COPR (ODA) and Aschochyta blight studies with the University of Reading, UK, identification of Rhizobial strains with Rothamsted Experimental Station, U.K., and witches broom resistance in pigeonpea with the University of Florida, USA, are a few important examples of collaborative researches in pulses.

From November 1982 ICRISAT ceased to support financially the collaborative project with the University of Queensland, Australia in developing photoinsensitive, short duration pigeonpea cultivars. However, ACIAR is now supporting the project. ICRISAT continues to have good collaboration with the project.

The Asian Development Bank (ADB) has agreed to fund a chickpea project to improve yield and resistance to diseases, especially Ascochyta blight, in Pakistan where chickpea is a very important crop.

Economics

A collaborative project between IFPRI, IRAT, ICRISAT and national programs has been started to study the patterns of demand and supply of coarse grains in West Africa. IFPRI is taking the leadership in this project, which includes 10 sub-projects. Three of these are being undertaken by ICRISAT.

In 1983 a small project was approved for funding by the Population Council entitled "Family Structure and Fertility: Theoretical and Empirical Analysis". It is a collaborative project between ICRISAT and the University of Pennsylvania. A major objective is to examine the effects of technological change in the SAT on the structure of families and the subsequent demand for children to be used as labor. This is of special relevance in Asia where the development of labor-using technological change is the appropriate strategy. If this causes greater demands for children then the food available per capita may not improve.

In 1983 a small project was approved for funding by the Ford Foundation on "Common Property Resources". The objective of this project is to assess the effect of common property on income of SAT farmers and landless families with a view to improving the management of common property for increasing the income of those depending on this type of resource.

X. Capital Requirements

Present estimates of Capital expenditure are as follows:

Summary Table

Details	Actual 1983 $'000	Current budget 1984 $'000	1985 $'000	Projections 1986 $'000	1987 $'000	1988 $'000
A. CORE CAPITAL						
1. Site Development ICRISAT Center	103	88	65	125	110	115
2. Campus External Work	10	65	-	-	-	-
3. Building Construction Phase II	446	-	-	-	-	-
4. Other Construction (Modifications/ Improvements)	70	164	440	179	400	495
5. Equipment	414	306	531	860	972	338
6. Others (including Architect fees)	66	-	-	-	-	-
7. West Africa-Capital unrestricted core	582	445	773	720	850	800
8. Contingencies 3%	-	32	25	57	70	52
SUBTOTAL	1,691	1,100	1,834	1,941	2,402	1,800
9. Sahelian Center -restricted core (estimate)		4,067	550	-	-	-
TOTAL	1,691	5,167	2,384	1,941	2,402	1,800

Construction

Minor construction and modifications to existing buildings are required at ICRISAT Center now that major construction is

completed. A segregation glass house costing $15,000 is required by the Plant Quarantine Unit to enable testing of new imports for the presence of pathogenic fungi and bacteria. The lack of this facility currently causes considerable delay in the release of incoming seeds and plant material by the national quarantine authorities. Also required is an insect-rearing facility for stem borer costing $35,000 and a glasshouse dedicated to entomology and virology research costing $50,000. New building requests are mostly for stores, seed-drying floors, and shelters for farm labor. Two houses costing $20,000 each are required at Hissar (Haryana Agricultural University) our most important substation in India. Currently we are leasing houses from the University, but space is scarce and we will have to vacate them. If funds are available we will provide a permanent facility for our International school.

Restricted core grants from the Governments of Italy and Switzerland and other funds still to be found will provide for the construction of the ICRISAT Sahelian Center. $550,000 is provided in the 1985 capital budget from these sources for the work to be carried out in this year--by which time the buildings should be nearing completion. Core capital construction funds are required elsewhere in West Africa to provide office and laboratory facilities for the relocated sorghum program.

Farm Development and Equipment

By the end of 1985 ICRISAT will have industries and new housing developments on three sides. The post and barbed-wire fence is no longer adequate and must be replaced for much of its 14.5 km length. This project was started in 1983, and in 1984 about 4 km will be completed. An additional 5 km is planned for 1985 at a cost of $100,000.

Completion of the Isotopes laboratory at ICRISAT Center was much delayed by changes in design and regulations. Qualified supervisory staff has been acquired and we now need to equip the lab more adequately for future work with isotopes of carbon, nitrogen, phosphorus, and iron and for a radiation source for genetic manipulations. Automation, computerization, and mechanization of our laboratory and field work must proceed as our labor force declines and particularly to speed up our analytical capability. ICRISAT Center does an excellent job in turning over the research fields from the rainy to postrainy season crop, but our physical efficiency needs to be matched by more rapid analysis and better planning of sequential experiments. Further computerization of our Publications Division is required to remove the current major bottleneck in layout and design.

With the completion of the Sahelian Center approaching it will be necessary to move ahead with the equipment needs. The funds provided in the budget, $440,000 will go only part way to fulfilling the need. Fortunately the special grants referred to earlier have already provided for most of the field equipment and fixed furniture required at the Center.

XI. Contingencies and Assumptions on Future Price Changes

Provision for increases in prices during 1985 has been considered and provided at 8% within the budget for 1985 intimated to ICRISAT. This is on the lines given in the guidelines and procedures for preparing 1985-86 programs and budgets circulated by the CGIAR secretariat.

The provision for increases in prices at 8% in 1985 has been made to offset expected inflation in India, the USA, and Africa (Upper Volta and Niger).

INDIA

The increase in consumer prices in India in 1983 was 13.6% over 1982. (Source: Economic and Political Weekly of 7 Jan 1984). The inflationary pressures in the Indian economy have continued gathering momentum, and a serious concern is expressed in many circles over the inflationary spiral that has emerged in recent months.

U.S.A.

The increases in prices were 6% and 4%, respectively, over the previous year during 1982 and 1983 (IMF's International Financial Statistics of October 1983 - Page 441). The projections of rates of inflation, as given by Citicorp's World Outlook (February 1984), during 1984 and 1985 are 5.1% and 6.9%, respectively. Inflation is likely to rise in the USA in the next few months. According to the International Herald Tribune of 25 Jan 1984, virtually all the economists, including those in the administration, expect at least some acceleration in inflation this year as the economic expansion continues.

AFRICA

Core operations for ICRISAT in Africa are presently in Niger and Upper Volta. As per data available in IMF's International Financial Statistics of 1983 (Page 527) the increase in prices during 1982 over 1981 had been 11% in Upper Volta and 12% in Niger. In the light of the indices available in IMF's International Financial Statistics of October 1983 (Pages 317 and 445) the increase in prices in 1983 in Niger appear to be under

control while the increase in prices in Upper Volta at the end of 1982 over end of 1981, had been around 16%.

The above analysis justifies the provision at 8%. If the CG Secretariat stabilization mechanism is put into operation, claims for reimbursement in 1985 will be made if justified by the actual data.

XII. Recommended Top and Bottom Funding Levels for 1985

TAC recommends that ICRISAT's funds be not less than $21,822,000 in 1985. If total funds are insufficient to provide the recommended budget of $23,518,000. ICRISAT proposes the following sequential reduction if required to reach the lower figure:

	In US $'000
RECOMMENDED TOP LEVEL	23,518
Reductions if Required:	
1. Groundnut Program - Sahelian Center	356
2. Training and Conferences - ICRISAT Center	130
3. New Capital Requests - ICRISAT Center and Africa	665
4. Sorghum Program - West Africa	200
5. Asian Grain Legumes Program - ICRISAT Center	100
6. West African Director's post	245
RECOMMENDED BOTTOM LEVEL	21,822

Each programmatic reduction in the above list includes an appropriate reduction in administrative and support costs, allowances for price increases, and contingencies.

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TABLES

ICRISAT

SUMMARY OF COSTS BY PROGRAM AND ACTIVITY 1985-1986 CORE BUDGET

(US $ '000)

TABLE I

ACTIVITIES	ACTUAL 1982		ACTUAL 1983		APPROVED 1984		CURRENT 1984		PROPOSED BUDGET 1985		PROJECTIONS 1986		1987		1988	
	MY	COST	MY	COST	MY	COST	MY	COST	MY	COST	MY	COST	MY	COST	MY	COST
1. MAJOR ACTIVITIES																
a. RESEARCH PROGRAMS :																
FARMING SYSTEMS																
ICRISAT Center	6	1,026	6	1,243	7	1,472	7.5	1,610	7.5	1,382	8	1,437	8.5	1,503	8.5	1,532
Africa Core	2	197	5.25	556	5	723	3.5	779	3.5	404	4	507	4.5	591	4.5	601
SORGHUM																
ICRISAT Center	5	861	5	980	5	1,037	5	992	5	972	5	980	5	989	5	998
Africa Core	2	335	9	1,370	7	1,209	5.5	1,156	5	597	5	629	5	642	5	657
MILLET																
ICRISAT Center	5	787	4.25	899	5	979	4.5	990	5	953	5	964	5	964	5	964
Africa Core	3	309	9	1,183	10	1,689	9.5	1,796	10	1,927	10.5	2,086	11	2,220	11	2,239
PULSES-CHICKPEA & PIGEONPEA																
ICRISAT Center	5	1,038	5	1,153	5	1,198	4.5	1,145	6	1,303	6.5	1,368	7	1,433	7	1,433
ICARDA	2	183	2	180	2	178	2	188	2	178	2	178	2	182	2	187
GROUNDNUT																
ICRISAT Center	5	799	5	961	6	1,036	5.5	1,103	6	1,060	6	1,079	7	1,185	7	1,208
Africa Core	-	-	1.5	142	4	559	2	236	4	589	4	627	4	635	4	644
ECONOMICS																
ICRISAT Center	3	373	1.5	328	2	404	1.5	370	2	363	2.5	410	3	461	3	461
Africa Core	2	299	3	440	3	356	3	411	2	277	2	287	2	293	2	300
SUMMARY : RESEARCH																
ICRISAT Center	29	4,884	26.75	5,564	30	6,126	28.5	6,210	31.5	6,033	33	6,238	35.5	6,535	35.5	6,596
Africa Core	9	1,140	27.75	3,691	29	4,536	23.5	4,378	24.5	3,794	25.5	4,136	26.5	4,381	26.5	4,441
ICARDA	2	183	2	180	2	178	2	188	2	178	2	178	2	182	2	187
SUB - TOTAL	40	6,207	56.5	9,435	61	10,840	54	10,776	58	10,005	60.5	10,552	64	11,098	64	11,224
b. RESEARCH SUPPORT SERVICE ACTIVITIES																
Office of Dir. Research	2	219	2	203	2	281	2	251	2	277	2.5	320	3	362	3	362
Plant Quarantine	-	48	-	65	-	82	-	82	-	71	-	71	-	71	-	71
Genetic Resources Unit	2	310	2	385	2	399	2	395	2	383	2	388	2	408	2	428
Biochemistry	1	167	1	177	1	210	1	218	1	187	1	194	1	194	1	194
FARM DEVELOPMENT OPERATIONS																
ICRISAT Center	1	737	1	1,246	1	812	1	802	1	855	1	892	1	922	1	922
Africa Core	-	-	-	-	1	263	0.5	133	1	241	1	248	1	253	1	259
Library & Documentation	-	211	-	227	-	263	-	343	-	287	-	295	-	327	-	347
INFORMATION SERVICES																
ICRISAT Center	4	418	4	434	4	537	3	466	3	469	3	471	3	480	3	490
Africa Core	-	-	-	-	-	-	1	87	1	87	1	87	1	89	1	91
Computer Services	1	212	1	204	1	184	1	201	1	247	1	252	1	260	1	265
SUMMARY : RESEARCH SUPPORT																
ICRISAT Center	11	2,322	11	2,941	11	2,768	10	2,845	10	2,863	10.5	2,883	11	3,024	11	3,079
Africa Core	-	-	-	-	1	263	1.5	133	2	241	2	335	2	342	2	350
SUB - TOTAL	11	2,322	11	2,941	12	3,031	11.5	2,978	12	3,104	12.5	3,218	13	3,366	13	3,429

Office of the Dir. Intl. Coop	1.75	204	2	265	2	261	2	258	3	453	3	471	3	471	3	471
Training & Fellowships	1	366	1	290	1	504	1	309	1	483	1	486	1	486	1	486
Conferences & Symposia	-	44	-	235	-	351	-	258	-	432	-	432	-	432	-	432
SUB - TOTAL	2.75	614	3	790	3	1,116	3	825	4	1368	4	1,389	4	1,389	4	1,389
3. GENERAL ADMINISTRATION																
Board of Governors	-	83	-	131	-	125	-	128	-	132	-	132	-	132	-	132
ADMINISTRATION																
ICRISAT Center	4	1,022	3.75	1,171	4	1,316	4	1,329	4	1,335	4	1,356	4	1,370	4	1,384
Africa Core	1	269	1	301	1	317	1	318	1	351	2	639	3	824	3	845
EPR	-	-	-	-	-	199	-	200	-	-	-	-	-	-	-	-
SUB - TOTAL	5	1,374	4.75	1,603	5	1,957	5	1,975	5	1,818	6	2,127	7	2,326	7	2,361
4. GENERAL OPERATIONS																
Transportation Motor Pool	-	298	-	339	-	396	-	370	-	308	-	320	-	320	-	320
Physical Plant Services	1	768	1	894	1	983	1	959	1	924	1	956	1	979	1	999
Housing & Food Services	1	270	1	318	1	349	1	232	1	307	1	296	1	296	1	296
General Expenses	-	2,137	-	1,337	-	1,831	-	1,851	-	1,614	-	1,900	-	1,957	-	2,016
SUB - TOTAL	2	3,473	2,	2,888	2	3,559	2	3,412	2	3,153	2	3,472	2	3,552	2	3,631
5. ALL OTHERS																
Contingency	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Provision for future price changes	-	-	-	-	-	-	-	-	-	1,556	-	3,341	-	5,346	-	7,556
SUB - TOTAL	-	-	-	-	-	-	-	-	-	1,556	-	3,341	-	5,346	-	7,556
TOTAL : SUMMARY																
ICRISAT Center	48.75	12,398	46.5	13,485	50	15,209	47.5	14,949	51.5	14,884	53.5	15,470	56.5	16,002	56.5	16,211
Africa Core	10	1,409	28.75	3,992	31	5,116	26	4,829	27.5	4,386	29.5	5,110	31.5	5,547	31.5	5,636
ICARDA	2	183	2	180	2	178	2	188	2	178	2	178	2	182	2	187
Provision for future price changes	-	-	-	-	-	-	-	-	-	1,556	-	3,341	-	5,346	-	7,556
GRAND TOTAL CORE BUDGET	60.75	13,990	77.25	17,657	83	20,503	75.5	19,966	81	21,004	85	24,099	90	27,077	90	29,590
SPECIAL PROJECTS	-	3,393	-	1,488	-	4,863	-	5,639	-	5,677	-	92	-	-	-	-
CATEGORIES OF EXPENSES :																
Personnel Services		7,132		9,419		11,472		10,700		10,198		10,859		11,450		11,653
Supplies & Services		5,445		6,195		6,889		7,526		7,538		8,088		8,389		8,489
Equipment replacement		466		903		654		660		389		389		389		389
Travel		947		1,140		1,488		1,080		1,323		1,422		1,503		1,503
Others : Contingency/future price Changes		-		-		-		-		1,556		3,341		5,346		7,556
TOTAL		13,990		17,657		20,503		19,966		21,004		24,099		27,077		29,590

ICRISAT

SUMMARY OF SOURCES AND APPLICATION OF FUNDS

TABLE II

1985-1986 BUDGET (US $ '000)

	Actual 1982	Actual 1983	Approved Budget 1984	Current Estimates 1984	Proposed Budget 1985	Projections 1986	1987	1988
SOURCES OF FUNDS:								
I. CORE OPERATIONS								
A. UNRESTRICTED (OPERATING & CAPITAL)								
1. Australia	461	449	-	481				
2. Belgium	83	-	-	-				
3. Canada	1,177	1,303	-	1,281				
4. F.R. Germany	740	720	-	646				
5. France	130	-	-	-				
6. Finlands	-	-	-	250				
7. India	125	125	-	125				
8. Mexico	100	100	-	-				
9. Nigeria	158	100	-	134				
10. Netherlands	320	365	-	350				
11. Norway	170	281	-	222				
12. Sweden	690	586	-	566				
13. Switzerland	384	439	-	497				
14. U.K.	1,103	976	-	964				
15. USAID	3,900	4,350	-	4,850				
16. World Bank	1,260	1,400	-	570				
17. Italy	269	439	-	-				
18. Unidentified Sources	-	-	17,879	1,789	19,094	24,208	29,305	31,177
Unexpended Balance from Pre.Yr.	1,062	1,321	1,136	1,699	1,735	1,865	2,104	2,330
Adjustments of Previous Year	15	88	-	-				
Sub-Total	12,147	13,042	19,015	14,424	20,829	26,073	31,409	33,507
B. RESTRICTED (OPERATING)								
1. i) UNDP-Sorghum and Millet Phase II	1,236	-	-	-				
ii) UNDP-Sorghum and Millet Phase III	-	1,051	1,149	1,149	1,239	1,313	-	-
2. European Economic Community (Pulses)	1,162	1,097		1,132				
3. France (Farming Systems-Africa)	-	123	-	140				
4. Japan (Groundnut)	1,300	1,425	-	1,540				
5. IDRC-Striga Upper Volta-Ph.II	200	183	-	-				
6. OPEC Fund (Groundnut)	100	55	-	100				
7. Rockefeller Foundation (Sorghum & Millet)	-	100	-	100				
8. The Leverhulme Trust (African Program)	654	752	-	815				
9. Belgium (African Program)	-	62	-	70				
10. GTZ: For Rain Sehlters at ICRISAT Center	-	124	-	-				
11. IFAD-For Improved Sorghums in Central America	-	75	350	350				
12. IFDC-Nitrogenous in Semi-Arid Tropics	-	97	83	83	53			

contd...2

Table II Contd...

	Actual 1982	Actual 1983	Approved Budget 1984	Current Estimates 1984	Proposed Budget 1985	Projections 1986	1987	1988
13. IFDC-Fertilizer Research Program in Africa	-	124	-	-	-			
14. IDRC-Groundnut Improvement Program-Malawi	-	215	20	20	284	153		
15. IDRC-Rural Economic Research in Africa	-	209	123	122				
16. IDRC-Sorghum and Millet Information Centre - Phase II	-	24	41	65	88			
17. Netherlands-Tillage Research in West Africa	-	102	360	216	196	205		
18. UNDP-African Coop Program for Improvement of Sorghum and Millet Phase III	110	1,545	1,485	1,453	1,614			
19. USAID-Semi-Arid Food Grain Research and Development	-	800	-	-	-			
Unexpended balances from Previous year Core	-	119	507	797	-			
Sub-Total Core-Restricted	4,762	8,282	4,118	8,152	3,474	1,671		
C. Total Core Funds (Operating & Capital)	16,909	21,324	23,133	22,576	24,303	27,744	31,409	33,507
II CAPITAL								
1. UNDP-For Sorghums & Millets-Phase III	-	29	-	-	-	-		
2. OPEC Fund-Groundnuts	65	-	-	-	-	-		
3. Government of Italy-Sahelian Center	-	1,386	1,386	1,731	-	-		
4. Government of Switzerland-Sahelian Center	-	-	500	950	550	-		
Unexpended Balance from Previous year	-	-	-	1,386	-	-		
TOTAL CAPITAL FUNDS	65	1,415	1,886	4,067	550			
III SPECIAL PROJECTS								
1. UNDP-African Coop Program for Improvement of Sorghum and Millet Phase II	1,060 (110)	-	-	-	-	-	-	-
2. USAID-Semi-Arid Food Grain Research and Development (SAFGRAD)	716	-	-	421	105	-	-	-
3. IDRC-Groundnuts Improvement Program-Malawi	242	-	-	-	-	-	-	-
4. IDRC-Rural Economic Research in Africa	88	-	-	105	197	92	-	-
5. IDRC-Sorghum and Millet Information Centre-Phase II	99	-	-	-	-	-	-	-
6. IFAD-Cold Tolerant Food Sorghum for Central America	225	-	-	-	-	-	-	-
7. IFDC, IFAD & UNDP-Nitrogen and Phosphorous Research in SAT - Phase II	164	-	-	-	-	-	-	-
8. Ford Foundation-Role of Common Property Resources in Farming System in Dry Farm Areas of India	-	-	-	37	-	-	-	-
9. Ford Foundation-Agrometerology Meeting	4	-	-	-	-	-	-	-
10. GTZ-Coop with University of Hamburg	54	130	-	55	-	-	-	-
11. GTZ-Coop with University of Giessen	30	70	-	90	-	-	-	-
12. GTZ-Coop Program for Scholar in Economics	10	-	-	-	-	-	-	-
13. GTZ-Watershed Management System ICRISAT	-	45	-	45	-	-	-	-
14. Government of Newzealand	2	3	-	-	-	-	-	-
15. IBPGR-Characterisation of Minor Millet	-	27	-	-	-	-	-	-
16. IDRC-Striga Upper Volta Phase I	5	-	-	-	-	-	-	-
17. IDRC-Sorghum and Millets Information Centre-Phase I	16	-	-	-	-	-	-	-
18. IDRC-Nitrogen Fixation with Non-Legumes Symposium	2	-	-	-	-	-	-	-
19. Texas Agricultural University-Sorghum Insect Identification Hand Book	18	-	-	-	-	-	-	-
20. UNDP Symposium on Agrometerology of Sorghum and Millets in SAT	20	-	-	-	-	-	-	-
21. USAID Coop Program Mali-Phase II	647	1,103	885	852	910	-	-	-
22. USAID Coop Program-Southern Africa (SADCC Countries)	-	-	3,978	3,262	4,465	-	-	-
23. UNEP-Meeting on Farming Systems	-	22	-	-	-	-	-	-
24. Population Council	-	21	-	20	-	-	-	-
25. WMO	-	3	-	-	-	-	-	-
Unexpended Balance from Previous Year	975	817	-	752	-	-	-	-
TOTAL SPECIAL PROJECT FUNDS	4,267	2,241	4,863	5,639	5,677	92	-	-

Table II Contd..

	Actual 1982	Actual 1983	Approved Budget 1984	Current Estimates 1984	Proposed Budget 1985	Projections 1986	1987	1988
IV EARNED INCOME	557	490	225	225	400	400	400	400
V TOTAL FUNDS	21,798	25,470	30,107	32,507	30,930	28,236	31,809	33,907
APPLICATION OF FUNDS								
a) Core Operations	13,990	17,657	20,503	19,966	21,004	24,099	27,077	29,590
b) Capital (Core)	2,162	1,691	2,986	5,167	2,384	1,941	2,402	1,800
c) Special Projects	3,393	1,488	4,863	5,639	5,677	92	-	-
Sub-Total (a) + (b) + (c)	19,545	20,836	28,352	30,772	29,065	26,132	29,479	31,390
f) UNEXPENDED BALANCES								
Unrestricted Core	194	407	-	358	358	358	358	358
Restricted Core	58	797	443	-	-	-	-	-
Capital (Core)	-	1,386	-	-	-	-	-	-
Working Funds	1,127	1,292	1,312	1,377	1,507	1,746	1,972	2,159
Special Projects	874	752	-	-	-	-	-	-
Sub-Total - Unexpended Balances	2,253	4,634	1,755	1,735	1,865	2,104	2,330	2,517
TOTAL APPLICATIONS	21,798	25,470	30,107	32,507	30,930	28,236	31,809	33,907
MEMO								
1. Total Core Funds (Operation & Capital) Required	16,909	21,324	23,133	22,576	24,303	27,744	31,409	33,507
Earned income applied in year	557	490	225	225	400	400	400	400
	17,466	21,814	23,358	22,801	24,703	28,144	31,809	33,907
Less: Unexpended and adjustments from previous Year:								
Unrestricted	(1,077)	(1,409)	(1,136)	(1,699)	(1,735)	(1,865)	(2,104)	(2,330)
Restricted	-	(119)	(507)	(797)	-	-	-	-
Earned Income	(557)	(490)	(225)	(225)	(400)	(400)	(400)	(400)
Working Capital Request	(65)	(165)	(176)	(85)	(130)	(239)	(226)	(187)
Sub-Total - Unexpended balances and adjustments	(1,699)	(2,183)	(2,044)	(2,806)	(2,265)	(2,504)	(2,730)	(2,917)
Net Core Operating Funds required from CG (a)	15,767	19,631	21,314	19,995	22,438	25,640	29,079	30,990
Total Capital Funds required - Core	65	1,415	1,886	4,067	550	-	-	-
Less: Unexpended Balances from Previous Year - Core	-	-	-	(1,386)	-	-	-	-
Net Funds Required from CG (b)	65	1,415	1,886	2,681	550	-	-	-
Working Capital (c)	65	165	176	85	130	239	226	187
2. Total Funds from CG (a)+(b)+(c)	15,897	21,211	23,376	22,761	23,118	25,879	29,305	31,177
3. Total Earned Income	557	490	225	225	400	400	400	400
Applied to Core and Capital	(557)	(490)	(225)	(225)	(400)	(400)	(400)	(400)

ICRISAT

SUMMARY FINANCIAL DATA
1982 - 1983
(US $ '000)

TABLE III

	1982	1983
CURRENT ASSETS:		
Cash and Bank Balances	1,114	875
Short Term Investments		
Citibank, New York	1,700	4,945
Others	2,310	2,310
Receivables from Donors	1,105	1,415
Other Receivables	941	1,398
Inventories	528	331
Prepaid Expenses	216	212
Vehicle Revolving Account	-	-
Other Current Assets	-	-
Interest accrued on:		
Short term Investments	2	
Others		
Total Current Assets	7,916	11,486
FIXED ASSETS		
Operating Equipment	412	420
Research Equipment	3,808	3,909
Vehicles	1,607	1,804
Furnishing and Office Equipment	2,238	2,284
Buildings	13,275	13,293
Buildings under construction	2,125	2,623
Other Fixed - Site Development Etc,	2,709	2,849
African Co-operative Program Assets:		
Buildings (Including under-construction)	522	629
Other Fixed Assets	382	696
Assets in Transit	428	659
Total Fixed Assets	27,506	29,166
Total Assets	35,422	40,652
LIABILITIES		
Account payable	2,722	4,291
Provision for contingencies	2,310	2,310
Grants Received in Advance	630	250
Other Liabilities-Overdraft with Bank	-	1
Total Liabilities	5,662	6,852
CAPITAL BALANCE AND UNEXPENDED FUNDS		
Capital Grants:		
Fully Expended	27,506	29,166
Unexpended/Transferred Projects		1,386
Sub-Total	27,506	30,552
UNEXPENDED OPERATING GRANTS:		
Unrestricted	1,321	1,698
Restricted	58	216
Transferred Projects-Operational		581
Special Projects	875	753
Sub-Total	2,254	3,248
Retained Income	-	-
Total Capital Balances	29,760	33,800
Total Liabilities and Capital	35,422	40,652

ICRISAT

1985-1986 BUDGET ESTIMATES

TABLE IV

TABLE OF POSITIONS AND MAN YEARS

ACTIVITIES	SENIOR STAFF								SUPPORT STAFF: SCIENTIFIC AND SUPERVISORY								SUPPORT STAFF: OTHER SUPPORT STAFF							
	POSITIONS				MANYEARS				POSTIONS				MANYEARS				POSITIONS				MANYEARS			
	ACT 1983	EST 1984	BUD 1985	BUD 1986	ACT 1983	EST 1984	BUD 1985	BUD 1986	ACT 1983	EST 1984	BUD 1985	BUD 1986	ACT 1983	EST 1984	BUD 1985	BUD 1986	ACT 1983	EST 1984	BUD 1985	BUD 1986	ACT 1983	EST 1984	BUD 1985	BUD 1986
1. MAJOR ACTIVITIES:																								
a. RESEARCH PROGRAMS:																								
Farming Systems	15	12	12	14	11.25	11	11	12	21	21	23	23	17.75	20	22	23	228	210	218	223	224.5	208.5	214	220.5
Sorghum	14	11	10	10	14	10.5	10	10	11	12	12	12	11	12	12	12	184	159	160	160	182.5	156.5	156.5	160
Millet	14	15	15	16	13.25	14	15	15.5	12	13	13	13	12	13	13	13	210	183	187	192	208.5	181	185	189.5
Pulses: Chickpea & Pigeonpea	7	7	8	9	7	6.5	8	8.5	20	22	23	23	20.25	21.5	22.5	23	180	184	192	192	179	182	188	192
Groundnut	8	8	10	10	6.5	7.5	10	10	16	14	17	17	14.25	14	15.5	17	162	171	190	195	160.75	168.5	182.5	190
Economics	5	5	4	5	4.5	4.5	4	4.5	8	8	9	9	7.75	7.5	8.5	9	51	47	51	51	50	47	49	51
TOTAL:	63	58	59	64	56.5	54	58	60.5	88	90	97	97	83	88	93.5	97	1015	934	998	1013	1005.25	943.5	975	1003
b. RESEARCH SUPPORT SERVICE ACTIVITIES:																								
Office of the Dir.(Res)	2	2	2	3	2	2	2	2.5	4	4	4	5	2	3	4	4	4	4	5	5	3.25	4	4.5	5
Plant Quarantine	-	-	-	-	-	-	-	-	3	3	3	3	3	3	3	3	12	12	12	15	11	12	12	12
Genetic Resources	2	2	2	2	2	2	2	2	5	5	5	5	5	5	5	5	80	79	81	81	80	79	80	81
Biochemistry	1	1	1	1	1	1	1	1	3	4	4	4	3	4	4	4	25	23	25	25	25	23	24	25
Farm Dev. Operations	1	2	2	2	1	1.5	2	2	7	7	9	9	6	7	8	9	191	201	206	206	190	198.5	203.5	206
Lib. & Documentation	-	-	-	-	-	-	-	-	3	4	4	5	3	4	4	4	26	25	25	31	24	23.5	25	26
Information Services	4	4	4	4	4	4	4	4	8	9	9	9	6.5	8.5	9	9	25	25	27	27	23	24.5	26	27
Computer Services	1	1	1	1	1	1	1	1	4	4	5	5	3	3.5	4.5	5	10	10	11	11	10	10	10.5	11
TOTAL:	11	12	12	13	11	11.5	12	12.5	37	40	43	45	31.5	38	41.5	43	373	379	392	401	366.25	374.5	385.5	393

2. INTL. COOP. ACTIVITIES:																								
Off. of the Dir. Int. Coop.	2	2	3	3	2	2	3	3	3	3	3	3	3	3	3	3	5	5	7	8	4.5	4.5	6	7
Training	1	1	1	1	1	1	1	1	4	6	6	6	4.5	5.5	6	6	12	11	13	14	10.5	11	12	13
T O T A L:	3	3	4	4	3	3	4	4	7	9	9	9	7.5	8.5	9	9	17	16	20	22	15	15.5	18	20
3. GENERAL ADMINISTRATION:																								
Administration	5	5	5	7	4.75	5	5	6	27	28	31	41	24	26	29.5	35.5	282	315	328	375	263.25	302.5	321.5	338.5
T O T A L:	5	5	5	7	4.75	5	5	6	27	28	31	41	24	26	29.5	35.5	282	315	328	375	263.25	302.5	321.5	338.5
4. GENERAL OPERATIONS:																								
Transportation Motor Pool	-	-	-	-	-	-	-	-	2	3	3	3	0.25	3	3	3	63	60	60	60	55	56.5	60	60
Physical Plant Services	1	1	1	1	1	1	1	1	14	16	16	16	13	16	16	16	263	261	273	290	250	256	267	275
Housing & Food Services	1	1	1	1	1	1	1	1	3	3	3	3	3	3	3	3	139	138	159	159	131.25	130.5	148.5	159
T O T A L:	2	2	2	2	2	2	2	2	19	22	22	22	16.25	22	22	22	465	459	492	509	436.25	443	475.5	494
GRAND TOTAL:	84	80	82	90	77.25	75.5	81	85	178	189	202	214	162.25	182.5	195.5	206.5	2152	2123	2230	2320	2086	2079	2175.5	2248.5

Senior (Principal) Staff : ICRISAT Category Principal/International Staff

Scientific and Supervisory Staff : ICRISAT Category I to V

Other Support Employees : ICRISAT Category VI to XI and Regular and Continuing Farm Labour

Statistics Services - included in the Office of Director (Research)

ICRISAT

TABLE V (a)

1985-1986 CAPITAL BUDGET
ICRISAT CENTER AND AFRICAN STATIONS

Categories	TOTAL COST $ (000)					
	Previous Year 1983	Current Year 1984	Budget Year 1 1985	Budget Year 2 1986	Projected Year 1987	Projected Year 1988
1. Advance Expenditure						
2. Land and Improvements	176	353	165	195	160	165
3. Building and Site Improvements						
- Structure		2,642	580	200	540	460
- Mechanical Services		380	133	30	70	55
- Electrical Services		355	280	45	65	100
- All other and Site Improvements		404	80	14	25	30
Total Building & Improvements	620	3,781	1,073	289	700	645
4. Installed Equipment, etc.						
- Furniture						
- Fittings						
- Equipments						
- Spares						
Total FFE & S	829	751	971	1,300	1,472	938
5. Consulting Services	66	250	150	100	-	-
6. Other Costs	-	-	-	-	-	-
7. TOTAL BEFORE CONTINGENCIES	1,691	5,135	2,359	1,884	2,332	1,748
8. Contingencies	-	32	25	57	70	52
9. TOTAL CAPITAL COST	1,691	5,167	2,384	1,941	2,402	1,800

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1985-1986 CAPITAL BUDGET
ICRISAT CENTER

TABLE V (b)

Categories	Previous Year 1983	Current Year 1984	Budget Year 1 1985	Budget Year 2 1986	Projected Year 1987	Projected Year 1988
	TOTAL COST $ (000)					
1. Advance Expenditure						
2. Land and Improvements	113	153	65	125	110	115
3. Building and Site Improvements						
- Structure		110	300	120	320	360
- Mechanical Services		20	40	20	30	40
- Electrical Services		30	90	30	40	80
- All other and Site Improvements		4	10	9	10	15
Total Building & Improvements	516	164	440	179	400	495
4. Installed Equipment, etc.						
- Furniture						
- Fittings						
- Equipment						
- Spares						
TOTAL FFE & S	414	306	531	860	972	338
5. Consulting Services	66	-	-	-	-	-
6. Other Costs	-	-	-	-	-	-
7. TOTAL BEFORE CONTINGENCIES	1,109	623	1,036	1,164	1,482	948
8. Contingencies	-	19	15	35	45	28
9. TOTAL CAPITAL COST	1,109	642	1,051	1,199	1,527	976

ICRISAT

1985-1986 CAPITAL BUDGET
AFRICAN STATIONS

TABLE V (c)

	TOTAL COST $ (000)					
	Previous Year 1983	Current Year 1984	Budget Year 1 1985	Budget Year 2 1986	Projected. Year 1987	Projected. Year 1988
1. Advance Expenditure						
2. Land and Improvements	63	200	100	70	50	50
3. Building and Site Improvements						
- Structure		2,532	280	80	220	100
- Mechanical Services		360	93	10	40	15
- Electrical Services		325	190	15	25	20
- All other and Site Improvements		400	70	5	15	15
Total Building & Improvements	104	3,617	633	110	300	150
4. Installed Equipment, etc.						
- Furniture						
- Fittings						
- Equipment						
- Spares						
TOTAL FFE & S	415	445	440	440	500	600
5. Consulting Services	-	250	150	100	-	-
6. Other Costs	-	-	-	-	-	-
7. TOTAL BEFORE CONTINGENCIES	582	4,512	1,323	720	850	800
8. Contingencies	-	13	10	22	25	24
9. TOTAL CAPITAL COST	582	4,525	1,333	742	875	824

ICRISAT

1985 CAPITAL BUDGET

TABLE VII

ADDITIONAL MACHINERY & EQUIPMENT

ICRISAT CENTER

(In US $ '000)

ORGANIZATION UNIT	ITEMS	
RESEARCH PRGRAMS :		
Farming Systems	Sundries	35,000
		35,000
Sorghum	Polycorders (2)	8,000
	Mettler balance HK 60 0.01 MG sensitivity	5,000
	Ergostrol analysis eqpt for grain mold	5,000
	Percival Incubator	5,000
	Sundries	5,000
		28,000
Millet	Sundries	20,000
		20,000
Pulses	Seed Counter	6,000
	Automatic Weight Recorder	5,000
	Polycoder	5,000
	YSI Model 32 Conductance Meter	4,000
	Humidity and Temp Control Eqpt	5,000
	Insect rearing Eqpt	4,000
	Automatic ELISA eqpt.	8,500
	Refrigerated Centrifuge	6,000
	UV Spectrophotometer	5,000
	Fertilizer Spreader	4,000
	Sundries	12,000
		64,500

contd...

ICRISAT **TABLE VII contd...**

ORGANIZATION UNIT	ITEMS	
Groundnut	ELISA Equipment	15,000
	HPLC Equipment	60,000
	Digital Balance & Polycorder	10,000
	Incubator/Shaker	7,000
	Germinator	5,000
	Mist generator	4,000
	Controlled humidity room unit	4,000
	Thresher	6,000
		111,000
Radio Isotope Lab	Automated Oxidiser	19,500
	Centrifuge	13,000
	Digital top loading balance	7,800
	Sundries	2,000
		42,300
Glass House	Electric Motors	10,000
		10,000
RESEARCH SUPPORT ACTIVITIES:		
Office of Director (Research)	Sundries	41,390
		41,390
Biochemistry	Amylograph	5,000
	Sundries	15,000
		20,000
Farm Development and Operations	Hand Pumps (5)	5,000
	Crop Thinner	7,000
	Rotavator	7,000
	Sundries	17,500
		36,500

ICRISAT **TABLE VII contd...**

ORGANIZATION UNIT	ITEMS	
Computer Services	Additional memory port for disks	24,950
	Sundries	8,810
		33,760
Information Services	Photo Comp/Set exposing and printing unit	19,500
	Sundries	1,950
		21,450
Housing & Food Services	Dough mixing machine	5,000
	Ice Cream Machine	5,000
	Sundries	6,000
		16,000
Administration	Photocopier	4,900
	Microcomputer	4,200
	Overhead Crane	20,000
	Sundries	6,000
		35,100
Physical Plant Services	Condensing Unit	6,000
	Mobile Radio test set	6,000
	Sundries	4,000
		16,000
	GRAND TOTAL	531,000

ICRISAT

TABLE VIII

ASSUMPTIONS ON PRICE INCREASE AND FLUCTUATIONS OF EXCHANGE RATES

1985 BUDGET PROPOSAL

(IN US $ '000)

Expense Categories		1984 $ Cost		1985 $ Cost	
		Currency Denomination & Amount	$ Equivalent	Currency Denomination & Amount	$ Equivalent
Personnel Services	Rupee	43,646	4,279	46,267	4,536
	$	4,563	4,563	4,837	4,837
	CFA	515,280	1,356	592,420	1,559
	Sub-Total		10,198		10,932
Supplies & Services Equipment	Rupee	35,996	3,529	38,872	3,811
	$	3,259	3,259	3,455	3,455
	CFA	285,000	750	342,000	900
	Sub-Total		7,538		8,166
Equipment & Replacement	Rupee	816	80	938	92
	$	280	280	308	308
	CFA	11,020	29	13,300	35
	Sub-Total		389		435
Travel	Rupee	9,221	904	10,322	1,012
	$	225	225	236	236
	CFA	73,720	194	84,740	223
	Sub-Total		1,323		1,471
	TOTAL	N/A	19,448	N/A	21,004

Note : No assumption has been made regarding fluctuations of exchange rates.

XIV. Governing Board--July 1984

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Dr.K.Kumazawa
Professor of Plant Nutrition
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Faculty of Agriculture
University of Tokyo
Bunkyo-ku, Tokyo
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XV. Senior Staff--as of July 1984

Administration

L.D.Swindale, Director General
J.S.Kanwar, Director of Research
C.R.Jackson, Director for International Cooperation
M.G.Wedeman, Principal Administrator
S.P.Ambrose, Principal Government Liaison Officer
B.C.G. Gunasekera, Principal Soil and Water Scientist, International Cooperation
S.J.Phillips, Special Assistant to Director General for Educational Affairs
V.Balasubramanian, Senior Executive Officer to Director General
Joyce Gay, Senior Administrative Secretary to Director General
Sunetra Sagar, Administrative Secretary to Director of Research
S.Krishnan, Senior Administrative Officer (International Cooperation)
D.Mitra, Fiscal Manager
A.Banerji, Assistant Manager (Fiscal)
V.S.Swaminathan, Senior Accounts Officer
A.N.Venkataswamy, Accounts Officer
C.P.Rajagopalan, Accounts Officer
B.K.Johri, Personnel Manager
Y.Bharadwaja, Asst. Personnel Manager
N.S.L.Kumar, Senior Personnel Officer
P.Suryanarayana, Senior Personnel Officer
R.Vaidyanathan, Purchase and Stores Manager
K.P.Nair, Senior Purchase Officer
D.K.Mehta, Senior Stores Officer
D.V.Rama Raju, Senior Purchase Officer
K.C.Saxena, Stores Officer
K.R.Natarajan, Shipping and Purchase Officer
S.K.Dasgupta, Senior Scientific Liaison Officer (Visitors' Services)
A.Lakshminarayana, Scientific Liaison Officer (Visitors' Services)
K.K.Sood, Security Officer
A.Ekbote, Security Officer
K.K.Vij, Senior Administrative Officer, Delhi Office
V.Lakshmanan, Assistant Manager (Administration)
N.Suryaprakash Rao, Resident Medical Officer
R.Narsing Reddy, Transport Officer (on study leave)
G.Vijayakumar, Transport Officer
K.Jagannadham, Administrative Officer
K.V.S.Bose, Travel Officer

International Cooperation

M.Tardieu, Coordinator of Programs, West Africa
K.F.Nwanze, Principal Millet Entomologist
and Team Leader, Niger
K.Anand Kumar, Principal Millet Breeder, Niger
B.B.Singh, Principal Millet Breeder, Niger (Maradi)
M.V.K.Sivakumar, Principal Agroclimatologist, Niger
D.C.S.Spencer, Principal Economist, Niger
M.C.Klaij, Principal Soil and Water Engineer, Niger
C.A.Giroux, French Writer/Editor, Niger
B.D.Marvaldi, Project Development Officer, Niger
P.J.Serafini, Farm Manager, Niger
D.C.Goodman, Administrative Officer, Niger
L.K.Fussell, Principal Millet Agronomist, Niger
C.M.Pattanayak, Principal Sorghum Breeder and Team Leader,
Upper Volta
K.V.Ramaiah, Cereal Breeder--Striga, Upper Volta
S.N.Lohani, Principal Millet Breeder, Upper Volta
E.R.Perrier, Principal Agronomist, Soil and Water
Management, Upper Volta
P.J.Matlon, Principal Production Economist, Upper Volta
Helga Vierich, Principal Social Anthropologist, Upper Volta
S.C.Gupta, Principal Millet Breeder, Senegal
J.F.Scheuring, Principal Cereals Breeder, Mali
S.V.R.Shetty, Principal Agronomist, Mali
S.O.Okiror, Principal Millet Breeder,
Team Leader, Nigeria
Brhane Gebrekidan, ICRISAT/SAFGRAD
Coordinator for Sorghum and Millet, Eastern
and Southern Africa, Kenya
R.P.Jain, Principal Millet Breeder, Sudan
S.N.Nigam, Principal Groundnut Breeder, Malawi
K.R.Bock, Principal Groundnut Pathologist, Malawi
V.Y.Guiragossian, Principal Sorghum Breeder, Mexico
Compton Paul, Principal Sorghum Agronomist, Mexico
K.B.Singh, Principal Chickpea Breeder, Syria
M.V.Reddy, Principal Chickpea Pathologist, Syria
L.R.House, Sorghum Breeder and Project Manager,
SADCC Regional Sorghum & Millet Improvement Project, Zimbabwe
E.W.Nunn, Research Station Development Specialist,
SADCC Regional Sorghum & Millet Improvement Project, Zimbabwe
W.Williams, Administrative Officer,
SADCC Regional Sorghum & Millet Improvement Project, Zimbabwe

Research Programs

Sorghum

L.R.House, Principal Plant Breeder and Leader
(on secondment to SADCC)
S.Z.Mukuru, Principal Plant Breeder

L.K.Mughogho, Principal Plant Pathologist and
Acting Program Leader
J.M.Peacock, Principal Plant Physiologist
K.Leuschner, Principal Cereal Entomologist
D.S.Murty, Plant Breeder
B.L.Agrawal, Plant Breeder
Belum V.S.Reddy, Plant Breeder (on leave)
N.Seetharama, Plant Physiologist
R.K.Maiti, Plant Physiologist
Suresh Pande, Plant Pathologist
R.Bandopadhyay, Plant Pathologist
S.L.Taneja, Entomologist
H.C.Sharma, Entomologist
H.B.Patil, Senior Research Asociate
S.P.Jaya Kumar, Administrative Officer

Pearl Millet

F.R.Bidinger, Principal Plant Physiologist and Program Leader
S.B.King, Principal Plant Pathologist
J.R.Witcombe, Principal Plant Breeder
K.K.Lee, Principal Cereal Microbiologist
K.N.Rai, Plant Breeder
B.S.Talukdar, Plant Breeder
Pheru Singh, Plant Breeder
S.B.Chavan, Plant Breeder
G.Alagarswamy, Plant Physiologist
V.Mahalakshmi, Plant Physiologist
P.Soman, Plant Physiologist
S.D.Singh, Plant Pathologist
R.P.Thakur, Plant Pathologist
S.P.Wani, Microbiologist
K.R.Krishna, Microbiologist
Nirmala Kumar, Administrative Officer

Pulses

Y.L.Nene, Principal Plant Pathologist and Leader
D.G.Faris, Principal Plant Breeder, Pigeonpea
W.Reed, Principal Entomologist (on sabbatic leave)
C.Johansen, Principal Agronomist
J.Arihara, Assistant Physiologist
O.P.Rupela, Microbiologist
J.V.D.K.Kumar Rao, Microbiologist
D.M.Pawar, Agricultural Officer
M.D.Gupta, Senior Research Associate
K.C.Jain, Plant Breeder, Pigeonpea
K.B.Saxena, Plant Breeder, Pigeonpea
S.C.Gupta, Plant Breeder, Pigeonpea
Onkar Singh, Plant Breeder, Chickpea
C.L.L.Gowda, Plant Breeder, Chickpea

S.C.Sethi, Plant Breeder, Chickpea
Jagdish Kumar, Plant Breeder, Chickpea
N.P.Saxena, Plant Physiologist
Y.S.Chauhan, Plant Physiologist
S.S.Lateef, Entomologist
S.Sithanantham, Entomologist
S.P.S.Beniwal, Senior Plant Pathologist
M.P.Haware, Plant Pathologist
J.Kannaiyan, Plant Pathologist (on leave)
A.M.Ghanekar, Plant Virologist

Groundnut

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D.McDonald, Principal Plant Pathologist
D.V.R.Reddy, Principal Plant Virologist
J.H.Williams, Principal Plant Physiologist
J.P.Moss, Principal Cytogeneticist
J.A.Wightman, Principal Entomologist
L.J.Reddy, Plant Breeder
P.Subrahmanyam, Plant Pathologist (on sabbatic leave)
M.J.Vasudeva Rao, Plant Breeder
V.M.Ramraj, Plant Physiologist
V.K.Mehan, Plant Pathologist
P.T.C.Nambiar, Microbiologist
P.W.Amin, Entomologist
A.K.Singh, Cytogeneticist
D.C.Sastri, Cytogeneticist
S.L.Dwivedi, Plant Breeder
R.C.Nageswar Rao, Plant Physiologist
A.B.Mohammed, Entomologist
P.Subrahmanyam, Administrative Officer

Farming Systems

S.M.Virmani, Principal Agroclimatologist and Leader
C.W.Hong, Principal Soil Scientist
G.E.Thierstein, Principal Agricultural Engineer
(on sabbatic leave)
T.Takenaga, Principal Agricultural Engineer
J.R.Burford, Principal Soil Chemist
D.Sharma, Coordinator, On-farm Research
A.B.S.King, Cropping Systems Entomologist
R.Busch, Principal Soil Scientist
M.Wurzer, Principal Assistant Soil Scientist
Piara Singh, Soil Scientist
Sardar Singh, Soil Scientist
T.J.Rego, Soil Scientist (on sabbatic leave)
K.L.Sahrawat, Soil Chemist
A.K.S.Huda, Agroclimatologist
M.R.Rao, Agronomist

M.S.Reddy, Agronomist
M.Natarajan, Agronomist
R.C.Sachan, Agricultural Engineer
K.L.Srivastava, Agricultural Engineer
R.K.Bansal, Agricultural Engineer
Prabhakar Pathak, Agricultural Engineer
C.S.Pawar, Entomologist
S.K.Sharma, Senior Research Associate
Surendra Mohan, Senior Administrative Officer
A.A.H.Khan, Senior Research Associate (Engineering)
V.M.Mayande, Senior Research Associate (Engineering)
S.Ramachandran, Senior Secretary

Economics

M.von Oppen, Principal Economist and Leader
R.A.E.Mueller, Principal Economist
T.S.Walker, Principal Economist
N.S.Jodha, Senior Economist
R.D.Ghodake, Economist
R.P.Singh, Economist
R.S.Aiyer, Senior Administrative Officer
K.G.Kshirsagar, Senior Research Associate
K.V.Subba Rao, Senior Research Associate
M.J. Bhende, Senior Research Associate

Support Programs

Biochemistry

R.Jambunathan, Principal Biochemist
Umaid Singh, Biochemist
V.Subramanian, Biochemist
Santosh Gurtu, Senior Research Associate
M.S. Kherdekar, Senior Research Associate

Electron Microscopy

A.K.Murthi, Engineer

Genetic Resources

M.H.Mengesha, Principal Germplasm Botanist and Leader
K.E.Prasada Rao, Botanist
S.Appa Rao, Botanist
R.P.S.Pundir, Botanist
P.Remanandan, Botanist
V.Ramanatha Rao, Botanist (on leave)

Plant Quarantine

B.K.Varma, Chief Plant Quarantine Officer
Upendra Ravi, Senior Research Associate
N.Rajamani, Senior Administrative Officer

Fellowships and Training

D.L.Oswalt, Principal Training Officer
A.S.Murthy, Senior Training Officer
B.Diwakar, Senior Training Officer
T.Nagur, Senior Training Officer
T.A.Krishnamurthi, Senior Administrative Officer

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J.B.Wills, Research Editor
Susan D. Feakin, Research Editor
S.M.Sinha, Assistant Manager (Art and Production)
D.R.Mohan Raj, Editor
H.S.Duggal, Senior Photographic Supervisor
G.K.Guglani, Senior Art Visualizer
T.R.Kapoor, Senior Supervisor (Composing Unit)
A.Antonisamy, Printshop Supervisor
N.V.N.Chari, Administrative Officer

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Murari Singh, Statistician

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J.Sai Prasad, Computer Programmer/Analyst
C.Kameswara Rao, Programmer/Analyst

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P.K.Sinha, Senior Documentation Officer
P.S.Jadhav, Library Officer
S.Prasannalakshmi, Library Officer

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S.Mazumdar, Assistant Manager (Food Services)
B.R.Revathi Rao, Assistant Manager (Housing)
D.V.Subba Rao, Assistant Manager (Warehouse)

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Sudhir Rakhra, Chief Engineer (Civil)
D.Subramaniam, Chief Engineer (Electrical)
U.B.Culas, Manager (Workshop)
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(Electronics and Instrumentation) (on study leave)
N.S.S.Prasad, Senior Engineer
A.R.Das Gupta, Senior Engineer (Communication)
D.C.Raizada, Senior Engineer (Airconditioning)
N.V.Subba Reddy, Horticulture Officer
D.V.S. Verma, Engineer (Machineshop)
R.Thiyagarajan, Engineer (Automobiles)
A.N.Singh, Engineer (Heavy Equipment and Tractors)
S.W. Quadar, Engineer (Office Equipment)
V.S.Raju, Senior Secretary

Farm Development and Operations

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S.N.Kapoor, Manager (Farm Operations)
S.K.Pal, Senior Plant Protection Officer
K.Ravindranath, Senior Engineer (Farm Machinery)
M.Prabhakar Reddy, Senior Agricultural Officer
M.C.Ranganatha Rao, Senior Engineer
S.Abid Ali Khan, Agricultural Officer
K.Santhanam, Senior Administrative Officer