AID Study on International Agricultural Research

Centers and the CGIAR

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THE INTERNATIONAL CENTER FOR TROPICAL AGRICULTURE (CIAT)
Cali, Colombia

CIAT was established by the Ford and Rockefeller Foundations in late 1967. It was the fourth international agricultural research institute. It had a general geographic (tropical America) as well as a commodity mandate.

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

Program. Research and training on dry beans (world-wide responsibility), cassava, rice, and tropical pastures (for beef and milk production). The commodity work is oriented to the development of improved varieties (higher yields, improved resistance to insects, diseases and climatic stress). The tropical pastures program is oriented to the better utilization of the acid and infertile soils of tropical America through improved pastures and associated animal production systems. Research is conducted at four locations in Colombia: the headquarters site and three field stations (Santander de Quiichao, Popayan, and Carimagua).

Budget (rev. 1980)

1. Core operating	14,364
a. Research	8,156
Tropical Pastures	2,511
Beans	1,548
Cassava	1,462
Rice	449
Other 1/	2,186
b. Other 2/	6,208
2. Core capital	1,437
3. Total core	15,801
4. Total special projects	2,000
5. Center total	17,801

- Total donors: 17
- USAID contribution to core: $3.65 million
- CGIAR estimate of 1981-82 inflation rate for CIAT: 13%

Senior Staff (rev. 1980): Man years, 57

1/ Statistical operations, research support, biochemistry, common lab, genetics.

2/ Training and conferences, library and documentation, general administration, general operation, other and contingency.

Country Interactions (1979)

- International Testing Program. International Bean Yield and adaptation Nursery. Cassava testing program in 12 Latin American countries. International Rice Testing Program for Latin America (254 sets of nurseries to 21 countries). Pasture testing program in 4 Latin American countries.

- LDCs. (1) National cooperative projects: beans, 2 projects in 2 countries (Guatemala and Peru). (2) Regional liaison scientists/services: beans, 2 projects in Central America and the Caribbean; cassava, outreach scientists in LA and Asia (terminated in 1980); rice, regional services program for LA (3) Collaborative research project: with ICA (Colombia) on rice. (4) Core research outside host country: 3 core-funded pasture scientists in Brazil.

- DCs. Collaborative research with Gembloux Univ., Belgium (beans); Univ. of Goettinger, Germany (cassava).

- Other IARCs. Collaborative research project with IFDC on phosphorus. Houses IRRI liaison scientist for LA and CIMMYT Andean regional Maize Unit.

- Training. 402 trainees in 1970, about half of whom were in research training and half were short course participants. From 38 countries, including 23 in LA and Caribbean.

State of Development. Relatively mature. Research program, especially for pasture, has been substantially modified in recent years as CIAT has sought to narrow its focus. Other programs are more fully established. Improved rice varieties released by CIAT have been extensively adopted in LA; improved bean and cassava varieties and pasture crops now undergoing extensive tests in national programs and should soon be released.

Note of Seed Work. A year or two ago, CIAT received a grant of $1.98 million from the Swiss Government to establish a Seed Unit. This unit both assists CIAT commodity units, provides technical assistance to LA nations, and provides training. Seed improvement is particularly important for beans.

CGIAR/TAC Review. 1977

Future Planning/Plans. CIAT has been working on a long-term plan for the 1980s which is expected to be released shortly.

Major Issues. Relatively few issues. A well run center. The crops under study have heretofore received relatively little study in the past and more background research has been needed than for wheat and rice. Relatively little research has also been done at the country level, for cassava, which may limit the immediate adoption of CIAT's work. Still, CIAT believes that it is approaching the point where it is generating sufficient new knowledge to warrant establishing a core-funded regional services program, particularly for beans in Central America and for cassava in the Caribbean and Asia. Some such programs are currently funded as special projects. This proposal has been held in abeyance pending further review. CIAT has received TAC approval to develop an upland rice research program (heretofore the work has been limited to irrigated crops), but expansion has been slow due to limited funding.

One issue that has not been raised for some time concerns systems work. In the early to mid 1970's. CIAT had a very ambitious farming systems program. It proved to be unworkable. Consequently nearly all systems work was dropped. We raised the question at the time of whether CIAT might well still continue some cropping systems work (some good but limited work was underway on corn-bean interactions). All that was maintained, however, was some work in the bean program involving climbing beans and corn. Recently some work has been done cassava-peanut intercropping. More such activities might be worth considering and might be more attractive to us than the current program on tropical pastures.

In the case of the tropical pastures program, we do not question the quality of the work, but question whether it is of greatest value to poor producers and poor consumers. Meat does play a larger role in thinking of national governments and in the diets of the poor in Latin America than it does in other developing nations. Also, there is considerable concern with upgrading the use of the acid, infertile soils. But we wonder if the resources might not be better spent on, say; upland rice, cropping systems, or some other commodity. We don't know the answer. It will be interesting to see whether this matter will be raised in the long-term plan; we suspect it will not.

The CIAT leadership is ambitious and has plans for expansion in various ways that may exceed current financial realities and which must be weighed against the needs of the other centers. It is difficult to see, for example, justification for their budget exceeding that of IITA which is operating in an area of higher costs where the research base is even less and where food needs are even greater. The main questions with CIAT may be ones of (1) program selection and balance, and (2) balance with the rest of the CGIAR system.

The International Maize and Wheat Improvement Center (CIMMYT)
El Batan, Mexico

The objectives of the International Maize and Wheat Improvement Center (CIMMYT) are to increase production of wheat and maize, particularly in the developing countries. The work began in 1943 as a Rockefeller Foundation program and the enter was founded in 1966. With headquarters near Mexico City, CIMMYT also controls four research stations and has cooperative work at three additional stations in Mexico. In 1980, CIMMYT had about 80 international staff, including some 20 regional staff serving in the Mideast, East Africa, Andean, Southern Cone, North and West Africa, South Asia and Central American regions. CIMMYT plans no major additions to program or physical plant during the 1980s.

Wheat

Wheat research in and for the developing nations has become exemplary under CIMMYT's leadership over the past 20 years. A few developing nations which collectively grow nearly 40 percent of the wheat grown in developing countries (India, Pakistan, Turkey, Mexico) now have such capable wheat research programs that all they may need from CIMMYT is germplasm with known characteristics and the technical information (especially genotype response and disease conditions) available through the global wheat research network. Other nations including Bangladesh, Nepal, Kenya, Tanzania, still need virtually completed packages of technology that they can choose from or easily adapt to their conditions. The wheat research program at CIMMYT reflects these changing conditions and only 4.5 senior scientist man years are at headquarters in 1981. Nearly 12 man years are in regional programs to help get national programs more involved in wheat research and production.

Bread wheat research focuses on broad adaptation and high yield. Greater resistance to major diseases, resistance to aluminum toxicity and development of high yielding lines for the humid tropics are major objectives. The strategy includes getting new genetic combinations by crossing wheats that have been evolving separately for thousands of years. (This work is in cooperation with Oregon State University and partially AID-funded.) The spring wheats, important to the developing world and certain sites in the temperate zone, are being crossed with wheats that are fall planted and require a cold period to induce flowering. These new gene combinations are likely to be useful to all wheat growers. A second strategy includes the formation of multilines as a protection from widespread and severe loss from disease. Lines that vary in their genes for disease resistance but are otherwise similar are combined as a single variety and new lines are substituted for susceptible ones as the disease organisms change.

Durum wheat objectives include greater disease resistance, improved straw strength and leaf characteristics, added cold and drought tolerance, greater earliness in high yielding types and improved processing qualities. Durum (macaroni types) wheat receives less emphasis than bread wheat because it occupies about 25 percent (30 million hectares) of the total wheat area.

Triticale, a cross between wheat and rye and probably the first man-made crop, is now planted on 360,000 hectares, mostly in developed countries. Several developing countries are involved in triticale testing and CIMMYT believes it will become a significant crop during the 1980s. Its first niche will probably be in areas that are a bit too cool and dry for good spring wheat production, such as northern India, Pakistan and Nepal and the highlands of East Africa. Triticale objectives are improved seed type and test weight and broadened germplasm base.

CIMMYT is the hub of a global wheat research network that includes collaborating scientists in 115 nations. In a typical year, CIMMYT distributed 38 different wheat nurseries for nearly 2300 trials. In 1979, 19 collaborating countries named and released 53 bread wheat varieties emanating from this testing system; six countries released eight durum wheat varieties; and seven countries released 13 varieties of triticale, including two in the U.S.

Maize

International maize research has been less successful than wheat research in increasing production in developing nations. Widely adapted varieties have been the mainstay of the wheat program but have eluded the maize program. The basic cause of location specificity in maize may be the plasticity of genotype that characterizes a cross-pollinated crop. Hybrids might be more stable than composites across environments. If so, the handicap of supplying new seed each year would have to be balanced against the broader adaptation gained.

A maize germplasm pool of some 13,000 lines is being systematically evaluated for characteristics that fit sub-categories of three broad ecological zones, tropical lowland, subtropical temperate and temperate highlands. There are 27 such gene pools, each with a specific set of selection characters such as disease and insect resistance, maturity period, grain color and kernel type. Lines and progenies move from the gene pools into advanced trials and undergo selection in representative locations worldwide. The procedure is designed to improve the performance of each population cumulatively in comparison to the six best local varieties or hybrids in global tests.

CIMMYT continues improving the protein content of select maize populations. Other major research objectives include resistance to three major diseases, drought tolerance, early maturity, wide adaptation, combining ability (to supply raw material for hybrids), improved grain to stover ratio and shorter stature. Insect and disease resistance and drought tolerance are sought by crossing maize with some related cereal species, including tripsacum and sorghum.

CIMMYT also fosters a global maize research network. In 1979, 615 trials were tested by collaborators in 84 countries. The raw data is returned to CIMMYT, analyzed and all results made available to each collaborator to plan the next trials. In 1979, 39 national maize programs asked CIMMYT for supplemental seed of materials selected in trials; often indicative of variety release or extensive national testing.

Training

CIMMYT's in-service training includes courses in production agronomy, crop improvement, laboratory procedures and experiment station management. Most in-service trainees spend a full crop season at CIMMYT with full involvement in field research, laboratory procedures and economics considerations. They return to their home institutions and usually become collaborators with CIMMYT, infused with remarkable esprit de corps. In 1979, CIMMYT had 96 in-service trainees. Wheat trainees came from 41 countries and maize trainees from 26. CIMMYT accepts a few graduate degree students in cooperation with universities in many countries. In 1979 there were 19 masters and five doctoral candidates, 10 post-doctorals and 77 visiting and associate scientists.

Outreach

CIMMYT had 7.5 man years of special project personnel directly involved in national programs in 1980. Six countries were involved, and $1.3 million. About 4.5 man-years and $438,000 were funded by AID loans, grants and excess currency ($135,000) in Pakistan, Guatemala and Zaire. CIMMYT has a scientist stationed at ICARDA to link with their durum wheat and barley research and two maize scientists at CIAT. CIMMYT cooperates with ICRISAT in high-altitude sorghum research.

Long-term planning

CIMMYT has a master plan through 1986 which assumes three percent annual growth. It states research priorities for each crop and projects international staff for each program. The plan stresses genetic factors to achieve greater yield dependability in the face of environmental stresses. They will increase emphasis on crop management and work more intensely with national scientists through increased regional capability. They foresee only one net additional scientist in Mexico but plan to increase their regional people by 13, to a total of 37. The increase of regional staff to help spread CIMMYT's technology conforms to a recommendation of the last TAC five-year review. In near-term projections, CIMMYT assumes an average of 20% inflation (22% internal and 9% U.S.). In 1980 Mexico's inflation was well above 22%.

Issue 1. Does the maize program have the best set of objectives and the most probably successful strategy? This should be fully examined during the quinquennial review and the long-term plan adjusted accordingly without regard to personalities.

Issue 2. Is CIMMYT giving adequate priority to developing wheats for the more tropical locations? There are difficulties and risks but we encourage CIMMYT to allocate substantial resources (say 2 or 3 man years per year) to the effort for enough years to test the hypothesis. This also should be fully examined during the quinquennial review.

Issue 3. Most CIMMYT wheat breeding successes to date are built on a narrow germplasm base. Although many developing countries achieve well under half the current yield potential, it may be time to try to both increase the yield potential of spring wheats and expand the genetic base. The spring X winter wheat crosses may form an important input. During the quinquennial review the priority of spring wheat research seeking a new yield plateau should be examined. Whether CIMMYT or other institutions should take the lead should not be prejudged. The international market for wheat should be factored into the decision.

Issue 4. CIMMYT's pattern of interaction with developing countries is to station regional staff at key places and work through that staff. The only real expansion of CIMMYT's program now planned is additional regional staff. An alternative mode of operation requiring less core funding would be to rely more heavily on national systems for dissemination of results and to accept special project funding to a greater extent where national systems require strengthening for this purpose. Is the additional regional staff worth the cost as compared with alternative approaches?

Appraisal and Recommendations

Continuation of CIMMYT's programs for wheat and maize at the present level (1981 $20.4 million) should be a category 1 priority, subject to conclusions of the forthcoming quinquennial review on issues 1-4.

Additional regional staff is category 3 priority.

CIMMYT's management is judged to be competent and its Board has sufficient breadth and quality of representation. There is no need for the CGIAR to insist on a voice in naming Board members although this should be done if the makeup of the Board is changed for any other reason.

CIMMYT's Budget ($000), 1980

1.	Core operating	16,518
	a. Research	10,460
	Wheat	3,528
	Maize	3,174
	Triticale	264
	Barley	148
	Economics	807
	Other[1]	2,539
2.	Core Capital	517
3.	Total core	17,035
4.	Total special projects	1,750
5.	Center total	18,785

[1] Station operations, common lab, statistics

[2] Training, conferences, library, documentation, general administration, general operatiin.

THE INTERNATIONAL POTATO CENTER (CIP)
Lima, Peru

CIP was established in 1971 as an outgrowth of (a) a program sponsored by USAID and North Carolina State University in collaboration with the Peruvian National Potato Program, and (b) the Rockefeller Foundation's International Potato Program in Mexico. Upon the recommendation of the Technical Advisory Committee (TAC) of the Consultative Group for International Agricultural Research (CGIAR) in 1972, CIP became the fifth international agricultural research center to be sponsored by the CGIAR.

Objective: To develop, adapt, and expand the research necessary to solve priority problems limiting potato production in developing countries. The research objectives are to increase the yield, stability, and efficiency of production of the potato in developing countries where it is grown and to improve the potato's adaptability to both heat and cold.

Program: CIP's research and training program is organized around nine major research areas. In consolidated form, these are: collection and maintenance of genetic material, control of disease and insect pests, management of potatoes under environmental stress, post-harvest technology and seed production.

CIP feels that its particular advantage in research centers about its extensive germplasm collection: maintaining it, providing facilities for its use, and distributing the material in disease-free condition to user agencies around the world.

CIP's research and training program is somewhat more decentralized than is the case of other centers. The field work is divided into seven regions around the world. These field offices also seek to establish national and regional capacities to evaluate, adapt, and redistribute technology. CIP also has some research carried out under contract with research institutions in developed nations (a step that is more easily done with the potato than with more purely tropical crops).

Budget (Rev. 1980)	thousands of dollars
1. Core operating	7,687
a. Research	4,560
Potatoes	(3,745)
Other 1/	(815)
b. Other 2/	3,127
2. Core capital	361
3. Total core	8,048
4. Total special projects	360
5. Center total	8,408

1/ Statistical operations, common lab, and equipment replacement.

2/ Training and conferences, library and documentation, general administration, general operation, other, and contingency.

- Total donors: 14
- USAID contribution to core: $1.7 million
- CGIAR estimate of 1981-82 inflation rate for CIP: 17%.

Senior Staff (Rev. 1980) Positions, 30. Man years, 29.

Country Interactions (1980)

- LDC's. (1) National cooperative projects: 5 in 5 countries. (2) Regional research programs: this is the core of CIP's extensive off-campus program. Regional evaluation, multiplication and distribution centers have been or are being established in Kenya, Turkey, and the Philippines; they will receive improved technology from CIP, evaluate it under local conditions and carry out distribution. (3) Off-campus core research: 5 countries (including several post-doctorals).

- DC's. Research projects with Cornell University, North Carolina State University, University of Wisconsin; Canada; University of Wageningen (Netherlands); Institute for Biochemistry, Braunschweig, Germany; and University of Hohenheim, Germany. Total funding of $244,000.

- Training. Most in-service or short-term group training is conducted at regional headquarters. Some research for graduate degrees is conducted at headquarters in Peru.

State of Development: Mature center. No additions or major reductions in staff for the core program are envisaged for the immediate future.

Reviews: CGIAR/TAC review in late 1976. CIP also makes extensive use of planning conferences for each of its major thrusts.

Future Planning/Plans: CIP has prepared a paper on the development of the center until 1995, "Profile-The International Potato Center (CIP) 1970-1995." Beginning in the late 1980's CIP expects a gradual reduction in requirements and hopes to transfer much of its applied research work to national programs in developing nations. The CIP center will then concentrate on work related to its germplasm collection and serve as a headquarters for information on potato research and short-term training courses in new potato research techniques.

Items of Interest: Among other things, CIP is involved in research on the technology to produce potatoes from true seed (rather than tubers) under a wide range of temperate and tropical environments. This process could be of great importance because it could sharply reduce planting costs and could sharply reduce the incidence of viruses. Both direct seeding and the transplanting of seedlings are being tested. CIP has also developed a simple, low-cost storage for seed potatoes under natural diffused light at ambient temperatures.

Major Issues: Very few. CIP has a well defined and structured research program and is doing a fine job. It acknowledges that its projected rate of decentralization of research activities may be thwarted by a slow rate of development of national research programs: if the present rate of

growth continues, CIP estimates that less than 10 of the 100 countries presently receiving CIP technology, will be ready to conduct their own applied research programs by 1990 if the present rate of growth continues. The principal long-term issue is how this role of improvement is to be accelerated: through increased activities within the core program, special projects, or action independent of the center and the CGAIR's?

THE INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS (ICARDA)

Aleppo, Syria - Beirut, Lebanon

ICARDA was established in 1977 by the Consultative Group on International Agricultural Research. ICARDA took over the ongoing Arid Lands Agricultural Development Program of the Ford Foundation. ICARDA's headquarters is located in beirut and its main field station is near Aleppo, Syria.

Objective. To improve the agricultural systems and major food crops of the drier regions of Western Asia and North Africa. Two major ecological zones are to be served: (1) the low elevation Mediterranean-type climate of cool, moist winters and hot, dry summers, and (2) the high elevation plateaus, with extremes of winter cold and summer heat, and snow cover for up to five months a year. The countries involved in these two zones range from Morocco in the west to Pakistan in the east, and from Turkey in the north to Sudan in the south.

Program. Research and training in:

- Cereal improvement. Barley, durum wheat, bread wheat. Winter cereals for high plateau region and spring cereals for low elevation regions.
- Food legumes. Lentils, chickpeas, faba (broad) beans.
- Forage improvement. Attempts to integrate animal and crop production. Identify and develop leguminous forage lines suitable for introduction into rotation systems to replace fallow.
- Farming systems. Attempts to adapt existing farming systems or develop new ones to use the existing soil, water, and other resources more effectively.

Budget. (Rev. 1980)	- thousands of dollars -
1. Core operating	8,852
a. Research	4,582
Cereal	1,006
Food legumes	883
Forage	503
Farming systems	883
Other[1]	1,307
b. Other[2]	4,270
2. Core capital	2,958
3. Total core	11,812
4. Total special projects	1,390
5. Center total	13,200

- Number of donors: 18
- USAID contribution to core: $3.25 million
- CGIAR estimate of 1981/82 inflation rate for ICARDA: 15%

[1] Statistical operations, common lab.

[2] Training and conferences, library and documentation, general administration, general operation, other, and contingency.

Senior Staff (rev. 1980). Positions, 28. Man Years, 25.

Country Interactions. (1979/80)

- Trials. Regional Wheat and Barley Nurseries: about 900 nursery sets were distributed to national programs, mostly in the Middle East and North Africa. Regional testing of food legumes: 594 sets of trials sent to 34 different countries.

- LDCs. National cooperative programs in Jordan, Cyprus and Syria. Regional grain programs in Tunisia and Turkey and a special cooperative project "Applied Research on Faba Beans in the Nile Valley", which involves Egypt and the Sudan and which is funded by the International Fund for Agricultural Development (about $1 million annually). Some core research in Jordan, Turkey, and Kenya.

- DCs. Univ. Manitoba, Canada (research on blight resistance in faba beans); Institute for Plant Protection, Univ. of Bonn.

- IARCs. CIMMYT (cereals), ICRISAT (chickpeas).

- Training. Six-month group training courses: enrollment of 46 from West Asia and North Africa.

State of Development. ICARDA is obviously a relatively new center and is still in the development stage. It has not had an easy time, due partly to circumstances largely beyond its control. ICARDA inherited an on-going program of field research from ALAD but little else. It obtained a fine site for its low elevation work near Aleppo in September 1977. This site was developed quickly and well. Some temporary structures have been erected, but no permanent major buildings have yet been built. The Iranian Government had identified a high altitude site near Tabriz but with the advent of the revolution in Iran, no further steps were taken. The administrative headquarters was established in Beirut and in 1979 ICARDA signed an agreement with the Lebanese Government to utilize two existing research facilities in the Beka'a valley; these facilities are undergoing limited restoration (the buildings were gutted during the Lebanese civil disturbances) and the sites are being used for some crop work. Thus the low elevation research work has been underway for several years, but little has yet been accomplished on the higher elevation program (attempts to develop such a program with Turkey have moved slowly).

CGIAR/TAC Review. First review tenetatively set for March-April 1983.

Major issues. There are quite a few, most stemming from ICARDA's location in a volatile region. The research program at Aleppo seems to be going rather well despite the many vicissitudes of the locale. The training program is well regarded.

- Funding. When ICARDA was established, there was an expectation that much of the funding would come from OPEC nations in the area. This has not worked out. Saudi Arabia was involved for two years but dropped out, presumably in part because it was more interested in irrigated than dryland agriculture. Iran was involved for a similar period, but then dropped out after the revolution. Other OPEC nations have not contributed directly in any major sense, yet all can make use of ICARDA's research.

- Capital development. Plans have been developed for the construction of permanent buildings at the Tel Hadia site. The cost in 1980 terms was $26 million. The probability of obtaining funds of this magnitude through the CGIAR are low (we would have more than a little hestitation about investing much money in structures in such an unsettled area). Hence, a capital funding compaign has begun outside the CGIAR in the Near East region. The probability of success is not known but is probably not high. ICARDA is making use of rented space in Aleppo and has erected temporary structures at Tel Hadia; the question is how long can they use such limited facilities without impairing their research program. This subject will be of major concern in the near future.

- Operational costs. The Near East is an expensive place to operate. Costs are high at Aleppo. There is some question as to how well both the board and management of ICARDA have done in keeping costs down in an admittedly difficult situation; both probably need to improve their performance.

- Staffing. Because of the uncertain civil situation in Syria, ICARDA has had some difficulty in recruiting senior staff. Qualified supporting staff are in short supply.

- Leadership. The initial director of ICARDA is due to retire this summer. A successor was named some time ago and has been serving as deputy director. There are divided views about how well he may do. The director of research, an excellent man, is also leaving to return to his university in Germany. Thus the coming period may be a bit uncertain in terms of leadership. The board, fortunately, has a new and more vital chairman and a fine new member in the presence of Lowell Hardin.

- Programs. Some technical/staffing questions need to be worked out with respect to the forage program and farming systems research (especially the animal component) but perhaps need not be explored here. Also ICARDA has tentative plans concerning the establishment of a germplasm storage in Lebanon (Terbol) which needs further thought.

- Irrigated crops. There has been, from time to time, pressure from within the region for ICARDA to get more heavily involved in irrigated crops. This is a controversial issue; there is some fear that if it took up irrigated work, the dryland work would be neglected (it is much easier for researchers to make advances in irrigated than dryland crops). Irrigation is unquestionably important in the area and the matter is of particular interest to the OPEC nations. Our inclination would be to go along with some irrigated work if its inclusion could attract substantial operational and capital funds from OPEC nations. We are not inclined to use AID funds for this purpose in this region.

- General. It is difficult to know where to come out on ICARDA. Our own views are split. ICARDA is needed, but there is a real question about how heavy an investment should be made in it, given the civil problems of the region and the high costs of operation. One compromise would be to continue to contribute our share of operating costs and to the cost of temporary structures, but to hold back on contributions to a permanent physical plant in the hope that these will be forthcoming from the region. This is not a wholly adequate or realistic approach (the lack of permanent structures may eventually levy a toll on ICARDA's operations), but it might be a relatively prudent one. We will have to give the issue further thought.

THE INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS (ICRISAT)

Patancheru (nr. Hyderabad), Andhra Pradesh, India

ICRISAT, established in 1972, was the first international center to be created under the aegis of the Consultative Group on International Agricultural Research.

Objective. To develop improved farming practices and better varieties of major food crops in order to improve the welfare of the poorest population of the seasonally dry semi-arid tropics (SAT), an area ranging over 49 countries and encompassing over 600 million people. More than half of this population, 350 million, live in India and many of the rest live in Africa.

Program. Research and Training. Improvement of the genetic potential of five major rain-fed food crops grown by resource-poor farmers:

- Cereals. Sorghum, pearl millet.
- Pulses/grain legumes. Chickpea and pigeonpea
- Groundnuts (peanuts). Also a legume.

ICRISAT also has two related programs. Its Farming Systems Research Program develops production practices and systems that result in improved, stable food production through better use of natural resources, particularly soil and water. The Economics Program examines the social and economic factors that condition farmers' responses to improved technologies.

Most of the work has been conducted in India, but is also, as appropriate being conducted elsewhere in the SAT, particularly West Africa.

Budget. (rev. 1980)

1. Core Operating	10,237
a. Research	5,958
Chickpeas, pigeon peas	1,004
Sorghum	974
Groundnuts	566
Farming systems	999
Economics	475
Other 1/	1,193
b. Other 2/	4,279
2. Core capital	2,360
3. Total core	12,597
4. Total special projects	2,129
5. Center total	14,726

- Number of donors: 17
- USAID contribution to core: $2.1 million
- CGIAR estimate of 1981/82 inflation rate for ICRISAT: 14%

1/ Farm services, genetics/plant quarantine, statistics, biochemistry.

2/ Training and conferences, library and documentation, general administration, general operation, other, and contingency.

Senior Staff (rev. 1980). Positions, 63. Man years, 53

Country Interactions (1979)

- LDCs. Extensive program of work on the improvement of sorghums and millet in semi-arid areas of Africa involving several country-based multidisciplinary teams, ranging from from 1 to 10 scientists (funded by UNDP, USAID/Mali 3/, USAID/OAU 4/, and IDRC). Research project with INIA, Mexico on sorghum.3/

- DCs. 6 projects (Centre for Overseas Pest Research, London; Max Plank Institute, Munich; Weed Research Institute, U.K.; University of Queensland, Australia; North Carolina State University). Linkages with the USAID CRSP on sorghum and millet at both the technical and administrative level.

- Other IARCs. Two ICRISAT scientists are stationed at ICARDA to work on chickpeas. Cooperates with CIMMYT on sorghum project noted above. An IFDC scientist is stationed at ICRISAT.

- Training. 74 scientists and in-service trainees.

State of Development. The program at the main campus is now relatively well developed; field work has been carried on for up to 10 years and the first stage of the building program was completed in August 1979; the second phase of the building program is underway. The program on sorghum and millet in Africa is much newer and given local conditions is probably even more challenging (noted below).

CGIAR/TAC Review. Late 1978. Most recommendations adopted. One of the more controversial suggestions was to investigate turning the pigeon peas program over to the Indian Government. This is being investigated by ICRISAT, but without much enthusiasm. Our own views are divided on this issue. Some other questions were raised about the organizational structure of the West Africa program; ICRISAT has subsequently given this matter further attention (a question about substations is raised under Issues, below).

Future Planning/Plans. ICRISAT is in the process of preparing a 10-year-plan for the 1980s. Generally ICRISAT plans little or no expansion at headquarters. Any expansion in staff will be in the West Africa Program. In some cases, this will represent replacement for staff and/or programs which are presently funded by special projects. It is anticipated that by 1982, 63% of the senior staff members will be assigned to headquarters, 33% in West Africa, and 4% in ICARDA.

3/ Research and training and sorghum and millet, Mali.

4/ Semi-Arid Food Grains Research and Development (SAFGRAD). Jointly sponsored by USAID and the Organization of African Unity. IITA is also involved in this project; it works on maize and cowpeas.

Note on West Africa Programs. This program started as a special project in 1974, has grown to include 10 authorized senior core positions and 14 special project positions. Work was carried on in Nigeria, Upper Volta, Mali, Senegal, Sudan, and Tanzania in 1980. A sub-center for work on sorghum for the Central Sudanian zone has been established at a national research station at Kamboinse, Upper Volta. Another sub-center for work on millet and farming systems in the drier South Sahelian zone is being planned for Niamey in Niger.

Major Issues. Relatively few issues, centered mainly on West Africa. The major question might concern how far and how fast the West African program will be able to expand to its planned size, given current financial restraints on the CGIAR system. As noted for IITA, the national research systems in Africa are generally not well developed (in contrast to the national research system in India), which means that ICRISAT's path may be a relatively difficult one. Further resources, beyond those already planned, may be needed. There has been some concern expressed by TAC that the two West African sub-centers not be overdeveloped; in the longer run it is considered preferable to work directly through national programs. Another related issue may be the need for ICRISAT to work out a joint strategy with ILCA and IITA; all share some of the same problems.

It is difficult to suggest answers to these issues. We simply do not know enough about ICRISAT's program in West Africa. The next meeting of the ICRISAT board will be held in West Africa in September 1981. This would provide an excellent opportunity to become better acquainted with the situation.

Additional Comments on ICRISAT Issues by Floyd Williams

1. ICRISAT program in Africa

Before ICRISAT was established, the planners looked at the entire semi-arid tropics and the crops that were important in those areas. They had a hard time deciding whether the ICRISAT headquarters should be placed in India or somewhere in Africa, probably West Africa. They finally decided to put the center in India but we recognized the importance of this same set of crops for Africa. It was clearly within ICRISAT's mandate to fulfill similar responsibilities for these crops in Africa and India. Appropriately, ICRISAT spent its early years establishing its program in India. About 3 or 4 years ago, AID encouraged ICRISAT to become more involved in Africa and to begin fulfilling its mandate for that area. They have done so. First with involvement in national programs as special projects and later (and increasingly so), with the assignment of core personnel to West Africa. They are making a fairly smooth transition from a series of special projects to assignment of their core staff and we encourage that transition.

The resource squeeze within the CGIAR and the difficulty of working in West Africa led the quinquennial review of ICRISAT to suggest that the ICRISAT program in Africa be run through national stations and that ICRISAT should not have its own facilities in Africa. While we encourage ICRISAT to work with national programs in Africa, I thought ICRISAT would need at least modest research facilities under its control in Africa and should not be totally depended on national programs for its research results.

Given the importance of these crops in Africa and the key role that ICRISAT can play in the development of African agriculture (including the national research systems), we want to be sure that ICRISAT functions optimally in Africa. There will be considerable pressure from many sides for ICRISAT to move slowly in its African program. We need to assure that ICRISAT is used to its fullest advantage for the development of both African crop technology and the African institutions to maintain that technology flow over time.

2. ICRISAT and pigeonpeas

The quinquennial review recommended that ICRISAT discuss with the Government of India the possibility of the pigeonpea research program at ICRISAT (especially the breeding program) being taken over by the Government of India. Their reason for suggesting this was that over 90% of the pigeonpeas are produced in India and the Indian research system contains significant capability in pigeonpea breeding. I was opposed to splitting off the breeding work from the rest of the pigeon research program and assigning that work to the Government of India. Most near term advances in pigeonpea technology will be embodied in varieties and thus involve the breeding process. India's pigeonpea breeders are not responsible for the global aspects of this crop. Further, the place of pigeonpeas in the developing world was well-known when ICRISAT was established. From an area standpoint they are of major current importance only in India but they have been widely planted for many years in Africa and in the Caribbean Islands and have good potential for becoming major

crops in these areas. Pigeonpea has good yield potential under quite adverse growing conditions and offers good opportunity to produce high protein food under the semi-arid tropical conditions. This was understood when ICRISAT was established and we want to assure that ICRISAT maintains its research program in pigeonpeas as long as it needs to do so.

THE INTERNATIONAL INSTITUTE FOR TROPICAL AGRICULTURE (IITA)
Ibadan, Nigeria

IITA was established by the Ford and Rockefeller Foundations in 1967. It was the third international agricultural research institute. It had a general geographic (tropical Africa) as well as a commodity mandate.

Objective. To improve the quality and quantity of food production in the humid and subhumid tropics through the improvement of important crops and the evolution of appropriate farming systems as alternatives to traditional low-yielding systems of cultivation.

Program. Research and training in crops and farming systems as follows.

- Crop Improvement. Cereal program: corn, rice. Grain program: cowpeas and soybeans. Roots and tubers: cassava, yam, sweet potato and cocoyam. IITA has worldwide responsibility for cowpeas, yams and sweet potatoes and regional responsibility for other crops.

- Farming Systems: Seek viable cropping and farming systems to replace shifting cultivation in humid and subhumid zones.

The range of crops studied at IITA is wider than at any of the other international research centers.

Budget (Rev. 1980)	- thousands of dollars -
1. Core operating	14,601
a. Research	7,023
Grains	1,455
Roots and tubers	1,138
Cereals	961
Farming systems	1,745
Other 1/	1,724
b. Other 2/	7,578
2. Core capital	499
3. Total core	15,100
4. Total special projects	4,216
5. Center total	19,316

- Total donors 14
- USAID contribution to core: $3.75 million 3/
- CGIAR estimate of 1981-82 inflation rate for IITA: 18%.

1/ Research support, statistical operations, and common lab.

2/ Training and conferences, library and documentation, general administration, general operations, other, and contigency.

3/ In addition, AID sponsors several special projects. The largest have been (a) Tanzania, food crops research (to have concluded in 1980), (b) Zaire, cassava research, and (c) SAFGRAD, maize and cowpeas. The SAFGRAD project is sponsored jointly with the Organization of African Unity and also involves ICRISAT (sorghum and millet, groundnuts). Smaller AID projects involve Ghana (farming systems research) and Sao Tome (technology transfer).

IITA recently faced severe financial problems, in part because of the rate of inflation in Nigeria. In response, the Government of Nigeria is making a substantial increase in its financial contribution for 1981. Some of this will be on a recurring basis and some on a non-recurring basis; we do not yet have the precise final breakdown.

Senior Staff (rev. 1980). Positions, 96. Man years, 87.

Country Interactions (1979)

- Networks. International Testing Program for Cowpeas. In 1979, 189 trial sets were sent to 48 countries.

- LDCs. (1) National cooperative projects: 9 in 9 African nations. (2) Regional program: Semi-Arid Food Grains Research and Development (SAFGRAD); 4 scientists stationed at Ouagadougou. (3) Research program outside of host country: cowpea research in Brazil. (4) Collaborative research projects, 4 in 4 nations (3 in Africa). (Projects sponsored by AID are noted in fn. 3.)

- DCs. With Boyce Thompson Institute, Cornell Univ. (nitrogen fixation in cowpeas and soybeans); University of West Australia (cowpeas), Dutch Research Institute for Plant Protection (viral diseases), and with 4 Belgian universities.

- Other IARCs. With IRRI, CIMMYT (corn), and WARDA.

- Training. Research for degrees, 35 M.S. and 26 Ph.D.; non-degree research, 163; group courses, 200.

State of Development. Relatively mature. Working however, in an area where national reserch systems are poorly developed. This means that the research base is generally quite limited and that there is often not a strong group at the national level to carry out further development. Since IITA is now generating improved technology which is being adopted in African nations or is undergoing field testing and adaptation, the state of national programs will be of increasing concern.4/

Reviews. CGIAR/TAC review conducted in 1978. IITA now at work on a long-term plan which is scheduled to become available later in the year.

Issues. The expansion of the research program at IITA's main campus has gone as far as it can in terms of existing facilities. Because of this and the need to more fully develop ties with national programs, IITA is proposing some decentralization of its core-funded research prorams. Three are proposed for 1981 (West Africa Cassava Improvement Program; West Africa.

4/ Recent examples are as follows. Cowpeas: a variety with improved insect resistance (Vita 5) is being released in 5 nations. Cassava: two disease-resistant varieties are expected to form the basis for a major production breakghrough in Nigeria; new high-yield varieties have been released in Sierra Leone (along with improved sweet potato varieties). Corn: two varietes adapted to lowland environments are being extensively grown in Nigeria.

rice-based cropping systems program; East and Central Africa maize improvement program). Two more will be started in 1982. This seems a good move in principal, but TAC at its July 1980 meeting wondered if it might not be premature. IITA sees this process as part of a gradual evolution away from almost complete emphasis on on-site research in its early years to about 25% of the research resources being used off-site in 1980, on to perhaps 40% in 1983. The financial implications of this process are not yet certain.

Because of the many needs of Africa, IITA is involved in a wider range of research and more special projects in individual countries than might otherwise be the case. So far, it seems to have done a good job of keeping all these balls in the air, but the calls will undoubtedly increase further in the future in IITA will have to take care that it does not spread itself too thinly.

The limited state of development of the research programs in Africa creates a perennial problem. How should IITA respond? Should it continue to get heavily involved with special projects? Or is some other approach preferable?

How should it better communicate, especially with systems in francophone countries? We don't have the answers. But it is a problem which is also shared by ICRISAT and ILCA.

At a recent meeting, TAC considered the coordination of upland rice research among the various international centers. It recommended that IITA concentrate on rice research in relation to farming systems and particularly for valley bottom lands. The IITA Board would like to retain a somewhat larger program. The new director of IITA has been asked to re-examine the question and report on the resource and staff implications at the TAC meeting this summer. The state of IITA's relationships to WARDA is a perennial related question. IITA has stationed a rice breeder at WARDA. Clearly the proposed West Africa rice-based cropping systems program would require close cooperation.

Because of difficulties of living and working in Nigeria, IITA has long had a somewhat higher rate of senior staff turnover than the other international centers. This rate seems to have stabilized in recent years.

Some of these issues, and perhaps others, may be addressed in the forthcoming long-term plan.

# THE INTERNATIONAL LIVESTOCK CENTRE FOR AFRICA (ILCA)
Addis Ababa, Ethiopia

ILCA was established by the Consultative Group on International Agricultural Research in 1974, the same year as the International Laboratory for Research on Animal Disease.

Objective. To assist national efforts to change production and marketing systems in tropical Africa so as to increase the sustained yield and output of livestock projects and improve the quality of life of people in this region.

Program. ILCA serves as (1) a research center to promote the development and demonstration of improved production systems, as (2) a training center to increase regional competence, and as (3) a multidisciplinary documentation center for the African livestock industry.

Method. ILCA is concerned with biological, social, and economic factors in livestock production. ILCA feels that these can best be studied as a system. The initial focus of ILCA's work has been to identify and study a small number of production systems typical of the arid, humid, and highland zones of tropical Africa. To complement these studies, ILCA undertakes research and studies in development processes, including the monitoring (survey and study) of livestock systems undergoing change. As a result, ILCA's program is somewhat more decentralized and more field oriented than the other IARCs (see Country Interactions below).

Budget (rev. 1980) - thousands of dollars -

1. Core operating	8,200
a. Research	4,600
b. Other[1]	3,600
2. Core capital	1,400
3. Total core	9,600
4. Total special projects	700
5. Center total	10,300

- Number of donors: 16
- USAID contribution to core: $2.4 million
- CGIAR estimate of 1981-82 inflation rate for ILCA: 15%.

Senior Staff (rev. 1980): Positions, 85. Man years, 72[2]

Country Interactions.

- Regional Programs and Research Outside Host Country. ILCA's main research thrust is on four regional programs differentiated according to ecological zones:

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[1] Training and conferences, library and documentation, general administration, general operations, other, contingency.

[2] These figures are high high considering the size of ILCA's budget and suggest that a different classification of senior staff is utilized.

(1) Arid Zones, Mali ($798,000, 6.5 senior man years) Improvement of fodder production and its quality in the secondary production systems. The development of socio and territorial units and the improvement of livestock nutrition in the framework of such units in migratory systems.[3]

(2) Subhumid Zones, Kaduna, Nigeria ($642,000, 5.6 senior man years). Improvement of dry season quality of livestock nutrition in the sedentarized Fulani system.

(3) Humid Zones, Ibadan, Nigeria ($657,000, 5.5 senior man years). Developing small ruminant production systems for village conditions, utilizing existing fallow land stands and through alleviation of disease and nutritional constraints.[4]

(4) Highlands, Ethiopia ($704,000, 6.5 senior man years). Better integration of livestock and cropping in small holder subsistance systems through the introduction of forages in cropping systems and the genetic improvement of cattle for milk production and traction.

ILCA is conducting studies of livestock development schemes in Kenya ($549,000, 4.1 senior man years), and establishing a regional network to study the use and potential of trypanotolerant breeds of cattle.

- National Cooperative Projects: Ethiopia, Botswana, Kenya, and Mali.

- DCs. Univ. of Hohenheim, Germany; development of farm planning model for small-holders system in highland research. National Institute of Agricultural Engineering, U.K.; role of animal traction in highland research

- IARCs. Some linkages being developed with IITA and ICRISAT farming systems work.

- Training. 10 fellows working in field research program. With completion of facilities at Addis Ababa, number expected to increase to 70.

State of Development. ILCA is still in the developmental stage but is not far from full development. The new headquarters complex was dedicated in the fall of 1980. ILCA planned to have 2/3 of its planned full staff complement in place in 1980 and its full complement in place by 1982 or so. It is doubtful that this pace will be attained because of funding problems (the CGIAR Secretariat has recommended sizeable cuts in ILCA's budget proposals, and donors such as AID have held back because of dissatisfaction with the program and management).

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[3] This appears to be the only project focusing specifically on migratory production.

[4] As yet there is no linkage with the CRSP on small ruminants, but it is planned to establish a tie.

Review/Planning. A CGIAR/TAC review is planned for late 1981. In preparation, ILCA is in the process of drawing up a long-term plan. TAC has sent several program review teams to ILCA in recent years.

Major Issues. ILCA is considered the problem child of the CGIAR system. Part of the problem is a broad, vague, and difficult mandate. Part is a series of managerial problems (the first director was fired; the current one has not, in the minds of many, provided strong leadership and expects to retire after the CGIAR review). And part may be due to special problems arising from its location in Ethiopia and the more general limitations of a decentralized mode of operation in Africa.

Disatisfactions with ILCA's progress have been brought to ILCA's attention on numerious occasions. The monitoring program (budgeted at $627,000) has been a particular subject of criticism. It has been going on for some time with little visible result. Some such background work is needed, but it is felt that it is time for ILCA to move from the relative passive survey and analysis stage into more active and clearly defined research activities. But both research staffing and program presently are weak in biological science. Financial management of the regional programs needs strengthening. The dialogue with national programs needs to be improved. The Board is considered to be doing a much improved job and now has a new chairman. But most observers feel that ILCA has a ways to go before good intentions are converted into program realities.

Given a period of relatively abundant funding, ILCA's problems might be viewed more indulgently. But in a period of very tight funding, the question of comparative marginal returns from an investment in ILCA and more established centers such as CIMMYT and IRRI becomes awkward. Some agriculturists who know livestock and Africa are apt to be more charitable than others who are familiar with progress in crops research centers elsewhere. ILCA's highland program seems to be progressing well, but there isn't much to show for the others yet. That may be too meagre a return in tough times.

Alternative possible courses of action for AID and the CGIAR might include the following:

a. Stop funding ILCA and put the financial resources saved into other IARCs. Possibly transfer some of the functions to other centers.
b. Continue funding at a moderate level and try to focus management and technical talent on a smaller number of more clearly defined problems.
c. Expand funding roughly in line with the resources provided to the other IARCs.

In either of the latter two cases, the hope would be that the forthcoming TAC review and the selection of a new director might be able to shape the organization up. As the review process continues, perhaps the most appropriate choice will become more obvious.

Additional Comments on ILCA Issues by Floyd Williams

In addition to the discussion presented on major issues at ILCA noted in the paper, I think the origin of ILCA's problems needs to be placed in perspective. Both France and the U.K. had been involved in livestock research in Africa during the colonial period. They were disappointed that the technology produced by their research during the colonial period (for example, for livestock disease control or pasture improvement) was never adopted by the African herdsmen. The documents developed during the formation of ILCA clearly show two threads of thought running parallel and never being resolved. One thread exemplified the French and British concept that the technological solutions to the livestock production problems in Africa were known but were simply not being used. The technologies were not used because the intricacies of the production systems within which they were to be used were not sufficiently understood. Therefore, the British and French wanted to study the livestock production systems in Africa with the assumption that if only those production systems were sufficiently understood, the technology that was on the shelf could be used to increase livestock productivity.

The second thread of perception of the work facing ILCA assumed that the needed technology was not available and would have to be developed. It was further assumed that collectively we did not sufficiently understand the livestock production systems in Africa to identify the needed technology and its required characteristics. To the Americans who held this view, ILCA was, like the other centers, a technology producing center. First, however, it would have to do sufficient analysis of the major livestock production systems being used in Africa to be able to identify points in those production systems where new technology could be applied to increase the productivity, and the essential nature of that technology to allow its use.

This difference of perception has persisted and has caused much of the dissatisfaction with ILCA's program. The confusion has been further exacerbated by the diversity of meaning of "systems" research. Stated concisely, the British and French believe that ILCA's business is to do systems analysis on the livestock production systems in Africa so that these systems are understood. The Americans believe that ILCA is to simply examine those production systems to identify where changes can be made and then develop the technology necessary to effect those changes.

There is no assurance that the quinquennial review will effectively surface this issue and bring about its resolution. It is sensitive and would end up offending many people. Further, a new director for ILCA may be able to defuse this issue by simply turning ILCA's program to less emphasis on systems analysis and more emphasis on technology production. If this happens and ILCA becomes reasonably productive, the U.S. should continue supporting ILCA. If ILCA persists in studying the livestock production systems in Africa and having that as its only product, the U.S. should seriously question whether it should give any support to ILCA. Our relationships with other donors, especially with Franch and U.K., and our relationships with the African countries, especially Ethiopia, would have to be considered.

International Laboratory for Research on Animal Diseases (ILRAD)

ILRAD was founded in 1974 in Nairobi, Kenya. It exists because there is major potential to increase cattle production for meat, milk and traction power in large areas of tropical Africa if trypanosomiasis can be controlled. (The same organism causes sleeping sickness in man.) The substitution of animal power for human muscle for tillage in Africa would profoundly affect the welfare of the people. Another disease, theileriosis (including East Coast Fever) is a serious constraint to livestock production in Africa, the Middle East, India and the Far East. ILRAD's mandate is to develop economic control measures for these two diseases. Since vector control and treatment are handled elsewhere, ILRAD is trying to develop vaccines. Except for some housing, the physical plant is built and the senior staff of 50 scientists is at work. Money is available for buying a ranch to supply disease-free cattle for experiments. No other major capital development or program change is expected in the near future.

Trypanosomiasis

The first major accomplishment, culture of the pathogen in the laboratory, was achieved in the first few months in a laboratory converted from a stable. The pathogen changes the proteins in its surface coat, thereby thwarting the host animal's defense antibodies which are protein-specific. Even when cloned the pathogen can produce at least 50 different antigens. Using genetic engineering techniques, the antigens can now be produced in quantity and characterized. A promising and novel line of research is based on the limited number of carbohydrate residues of the surface coat proteins. These share antigenic properties and if ways can be found to get a strong antigenic response to them, they could form the basis for a vaccine. An alternative approach is to base the vaccine on the antigens produced by the pathogen when it is in its tsetse fly vector form; transfer the proper genes from the pathogen to bacteria; have the bacteria produce the antigen; and use that antigen as vaccine.

Theilerosis

The theileriosis program has recently received added emphasis and it is now 40 percent of the total program. The pathogen in its host cell have been cloned to assure supplies of genetically uniform material for research. The immune responses of host lymph cells to both "indigenous" and "foreign" pathogens is being examined. Infected cells, rather than just the pathogen, may be responsible for resistance to reinfection in recovered animals. In this area also genetic engineering techniques such as cell hybridization are important to the rate of progress.

Outreach and Training

ILRAD works closely with The International Center for Insect Physiology and Ecology (ICIPE) in its theileriosis program. It does not yet have extensive linkages with developing country institutions outside Kenya. ILRAD will soon be ready to field test potential vaccines. Our major concern during the recent quinquennial review was that ILRAD start the considerable preparatory work needed for reliable field tests.

The review also recommended increased training activity but did not go on to specify that ILRAD's training purposes would be quite different from those of

some of the other centers. Few of the developing countries will soon be doing such sophisticated immunological research as is done at ILRAD. Training should therefore be directed at meeting ILRAD's own needs for staff and at creation of the means for testing potential vaccines and using and monitoring their effectiveness. There are now eight doctoral degree candidates and that program will expand. ILRAD cooperates with veterinary colleges in New York, Washington, U.K., and other European countries.

Long-Term Role

The recent five-year review examined whether ILRAD should accept responsibility for additional diseases, such as African Swine Fever and concluded it should not. The success or failure of the vaccine approach to trypanosomiasis and theilerosis control will not be known for several years. ILRAD's longer term future should be examined again when the outcome and duration of its present tasks are known, to see what further use, if any, can be made of its capabilities.

Management Issues

ILRAD has recently had some difficulties evidenced by lack of coherent leadership and program direction and evidence of insufficient fiscal controls. These problems were identified through normal CGIAR monitoring and evaluation and necessary steps have been taken to deal with them.

Assessment and Recommendation

This laboratory is doing excellent research on two specific, difficult and important problems. ILRAD's program at the current real level of $11.6 million per year should have priority 1 for continued CGIAR support. Changes up or down in program level may take place depending on the progress of research.

Budget (rev. 1980)	- thousands of dollars -
1. Core operating	8,516
a. Research	6,218
Trypanosomiasis	2,916
Theilerosis (East Coast Fever)	2,172
Other[1/]	1,130
b. Other[2/]	2,298
2. Core Capital	2,757
3. Total core	11,273
4. Total special projects	0
5. Center total	11,273

1/ Station operations, common lab., statistics.

2/ Training and conferences, library and documentation, general administration, general operation, other, and contingency.

THE INTERNATIONAL RICE RESEARCH INSTITUTE (IRRI)
Los Banos, Laguna Philippines

The International Rice Research Institute (IRRI) was established by the Ford and Rockefeller Foundations in 1960. It was the first international agricultural research center and became a prototype for those which have followed.

Objective. To conduct research leading to increased rice production and to improve the nutritive and economic benefits to those who produce and use rice.

Program. Research and training on rice and rice-based cropping systems. The work is organized into nine interdisciplinary programs: (1) genetic evaluation and utilization, (2) soil and crop management, (3) control and management of pests, (4) machinery development, (5) irrigation and water management, (6) constraints on yields, (7) climatic environment and its influence, (8) consequences of new technology, and (9) rice-based cropping systems.1

Budget (rev. 1980) - Thousands of dollars -

1. Core Operating	$15,715
a. Research	9,948
Rice	7,582
Cropping Systems	1,716
Regional Programs	650
b. Other[1]	5,767
2. Core capital	404
3. Total core	16,119
4. Total special projects	5,285
5. Center Total	21,404

- Number of donors: 17
- USAID contribution to core: $3.85 million[2]
- CGIAR estimate of 1981-82 inflation for IRRI: 13%

Senior Staff (rev. 1980): Positions, 59. Man years, 57

Country Interactions (1979)

- Networks. International Rice Testing Program (IRTP), plus 4 others. In the IRTP in 1979, 1,100 sets of nurseries (seeds) were sent to scientists in 76 countries; data were received from 431 individual trials. Other networks

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[1] Training and conferences, library and documentation, general administration, general operation, other and contingency.

[2] In 1979, USAID contributed $3.6 million to core operations. In addition in 1979, USAID contributed $1.6 million for eight special projects, the biggest of which involved assistance to national programs in Sri Lanka, Indonesia and Pakistan (details are summarized in IRRI's Research Highlights for 1979, p. 128).

include the International Cropping Systems Network, International Network on Soil Fertility and Fertilizer Evaluation for Rice, International Rice Agroeconomic Network, and International Farm Machinery Network.

- LDCs. (1) National cooperative projects: 11 in 7 Asian countries. (2) Regional liaison scientists: 5 (2 part-time).)3) Deepwater rice project in Thailand. (4) Collaborative research projects: 10 in 7 countries or groups of countries. (Projects sponsored by AID are noted in fn. 2.)

-DCs. With Boyce-Thompson Institute, USA, on nitrogen fixation. Also some contacts with Tropial Products Institute, U.K.; Japanese Tropical Agricultural Research Center, and ICIPE.

- Other IARCs: CIAT (regional liaison scientist), IITA (regional liaison scientist), WARDA (exchange of materials), IFPRI (rice policy), and IFDC (fertilizer study).

- Training. 426 scientists from 33 countries, plus 100 rice production specialists in short courses.

State of Development. Mature. High-yielding varieties developed by IRRI and often further developed in national programs now widely used in LDCs around the world.

CGIAR/TAC Review. 1975. Next review now being planned; scheduled to be held in January 1982.

Recent Items of Note. Development of extensive collaborative relationships with People's Republic of China. The PRC is by far the leading producer of rice in the world and has a vast array of germplasm which could be of great value to IRRI. It is also the world leader in certain aspects of rice breeding, particularly the development of hybrid varieties, and in the use of azolla or blue/green algae for fertilization. Cooperative research is underway in both areas. An IRRI team also recently advised the PRC Government on the establishment of a national rice research center.

Future Planning/Plans. Long-range planning committee set up in 1976 and report issued in 1979 (91 pp.). No sharp changes proposed. Some of the general recommendations were that:

- In its core program, IRRI should give primary attention to activities that complement and support those of national programs and that minimize competition with those programs.

- In its international program, IRRI should continue to provide support and liaison relationship with national rice research and training institutions.

- The size and scope of both programs should not greatly increase.

A key question concerns balance among types of rice culture. The major factors that influence the appropriate balance are (1) the extent of past research, and (2) the relative gains to be expected from the research. The study concluded that IRRI should contiue to place heavy emphasis on rainfed

(both wetland and dryland) rice until the production potentials have been more fully ascertained. Work on irrigated rice should continue to receive major attention, but IRRI's focus should be more strongly on those activities not easily carried out by national programs. Work on flooded areas should continue to concentrate on medium-deepwater rice culture.

The study indicated that nearly half of future rice production increases are expected to come from cropping intensification and that this justifies the high priority given to cropping systems research. IRRI's focus on rice-based systems is somewhat more specific than the pattern followed at other centers.

Major Issues. Relatively few. IRRI is well organized and well run. Since IRRI has been established for 20 years and is in an area where national rice research programs are good or improving, its role will probably begin to change over the next few years. It is anticipated that greater attention will be given to rainfed rice, which has been somewhat neglected in national programs. More generally, IRRI expects to give more attention to basic research, to carrying out applied research in collaboration with national programs, and to act as a catalyst for international cooperation. We agree with the thrust of these proposals.

One perennial issue is IRRI's agricultural engineering program on small-farm machinery. The question here is whether it is necessary to take on a function that might be handled by private enterprise - particularly when mechanization can have adverse economic and social impacts. IRRI feels that it does have a role and that by concentrating on small-scale machinery, the adverse effects are small. They are also studying these effects (in part with AID funding). The budget for this program was about $600,000 in 1980. The program might be considered in the forthcoming five-year review.

One item that may bear further thought is the likely role of special projects. In the past, as reflected in item 5 of the 1980 budget noted earlier, IRRI has been heavily involved in special projects, principally with national programs. Some of these have been sponsored by USAID (fn. 2). The decisions on whether to take on these projects were largely made by the Director-General. A year ago the Board of Trustees indicated that they wanted to play a larger role in the decisions on the larger projects. Whether this will affect the number of special projects taken on is not yet clear. But in view of the relatively advanced nature of the national research systems in Asia, the role of special projects may decline. What will take their place as a vehicle for national contacts? CIMMYT has a much larger core outposted regional staff than does IRRI and fewer special projects; whether a similar program would be appropriate for IRRI is not certain. Perhaps this matter might be considered in the forthcoming TAC review of IRRI.

THE WEST AFRICA RICE DEVELOPMENT ASSOCIATION (WARDA)[1]
Monrovia, Liberia

WARDA is an intergovernmental association of 15 West African countries, set up with the objective of achieving self-sufficiency in rice production in the region. WARDA sponsors a range of rice development activities including research. WARDA was formally organized in 1970, its Secretariat established in late 1971, and field programs began in 1973. The CGIAR first began to provide funding for portions of the research program in 1974.

Program. WARDA's overall program involves selection and promotion of improved varieties and practices through specialized programs of research, development, training and dissemination of information. About half of WARDA's resources are spent on research. The CGIAR principally supports the portion of the research program involving coordinated variety trials (which in turn includes the cost of subregional coordinators, trials, a seed nursery and a seed laboratory). The CGIAR is also progressively assuming some of the costs of the supervision of WARDA's special research projects (4 research stations located in 4 countries).

Budget (Rev. 1980)	- thousands of dollars -
1. Core operating	2,200
a. Research	1,724
Research	938[2]
Research Support	786[3]
b. Other	476
2. Core capital	285
3. Total core	2,485[4]
4. Total special projects	-
5. Center total	2,485

- Total donors: 11

- USAID contribution to core through CGIAR: 0.
(AID has not provided central funding to WARDA for two years because adequate funds have been forthcoming from other donors. AID's Africa Bureau, however, has provided funding for two of the special research projects (see fn. 5) and perhaps for some other activities.)

- CGIAR estimate of 1981-82 inflation for WARDA: 12%.

1/ This note is written from a DS/AGR point of view. The Africa Bureau is involved in the sponsorship of some of WARDA's activities (see fn. 5), but has not yet been consulted about the matters discussed here.

2/ Includes $708,000 for the subregional coordinators and $203,000 for the actual cost of the trials.

3/ Includes $179,000 for the seed nursery, $208,000 for the seed laboratory, $41,000 for germplasm work, and $286,000 for research coordination (including the leaders of the special research projects).

4/ Includes $211,000 for conferences and training and $265,000 for general administration.

Country Interaction. The principal activity sponsored by the CGIAR, the coordinated variety trials, are carried out in each of the 15 member nations of WARDA. Administration of this program is in the hands of a Sub-Regional coordinator and an assistant located as follows:

- Gambia. Senegal, Guinea Bissau and Mauritania
- Guinea. Sierra Leone, and Liberia
- Upper Volta. Ivory Coast and Mali
- Ghana. Nigeria
- Niger. Togo, Benin

In 1980, some 225 sets of seeds and chemicals were distributed to about 61 sites throughout the region. The packets include varieties introduced from IRRI, IITA, CIAT, IRAT and national programs in Asia, South America, and West Africa. The purpose is to identify varieties which are well adapted to the different ecologies that exist in the region.

The special research projects for which the CGIAR pays the cost of the project leader are located in Senegal, Sierra Leone, Ivory Coast, and Mali.5/ Some of the coordinated trials are also done at these stations.

IITA has posted its senior rice breeder to WARDA. WARDA also has a collaborative research project with the Catholic University in Belgium.

Planning/Sponsorship. WARDA has prepared a Five-Year Development Plan. It will be presented and discussed at a WARDA Donors' Conference at FAO on April 14-16, 1981. The conference is being co-sponsored by FAO and UNDP. One of the purposes is to "draw the attention of the participants to the financial requirements for the implementation of the Plan during the period 1981-85." WARDA had a CGIAR/TAC review in late 1978.

Major Issues

1. WARDA is an anomaly within the CGIAR because (a) it is only partly a research organization , and (b) it is strictly regional in nature. There is even less reason for it to be sponsored by the CGIAR than, say, CATIE, which is not. Ideally, WARDA, CATIE and other such groups would be sponsored by a Consultative Group for Regional Agricultural Research Organizations or by regional groups. In time it may be possible to wean it from the CGIAR; efforts such as the April FAO/UNDP conference may be a step in this direction. We should encourage such actions. DSB's immediate concern with this matter, however, is tempered by the fact that none of its funds are involved (we hope to keep it this way). Perhaps, with the CADA exercise underway, AID's Africa Bureau will or should become more heavily involved in the sponsorship question.

5/ AID/Africa also contributes to the more general costs of the research projects in Sierra Leone (Rokupr, mangrove rice) and in Mali (Mopti, deep flooded and floating rice). The Africa Bureau has proposed continuing support of theseprojects, plus support for several other non-research activities through 1985.

2. There is a danger of a lack of overall monitoring of WARDA's work because of the piecemeal funding. Many donors are involved and each contributes only to a small piece of the overall program. Even within AID, two bureaus are involved in separate pieces of the program; and they do not work very closely. If a regional sponsoring group could be established (as suggested in item 1 above), perhaps this issue would be more adequately handled.6/

3. Presently IITA is also involved with rice in Africa. Although TAC has recommended that IITA phase out of part of the rice work, IITA wants to keep a rice research capacity, particularly in rice disease, and to service 2ther African nations outside WARDA's purview. There has been some coordination between the two groups, and as noted above, IITA has stationed a breeder at WARDA. Still coordination/cooperation between the two groups, as well as with other rice research groups in Africa, could well be increased and improved.

6/ On the other hand, the loss of CGIAR/TAC monitoring respsonsibility, if only for part of the program, might be a real loss. Some individuals feel that such an international group, which is able to draw on an international group of authorities, can be of considerable help in improving programs and management. There is a question whether a regional group would carry such authority. Perhaps some sort of interaction would be needed between the CGIAR and the regional sponsoring group. Thus one question might concern the kind of support WARDA might continue to need from the CGIAR system.

THE INTERNATIONAL BOARD FOR PLANT GENETIC RESOURCES (IBPGR)
Rome (FAO), Italy

IBPGR was organized in 1974 and first funded by the CGIAR in that year. Its organization and function are quite different from those of the IARCs but it works very closely with the centers dealing with crops.

Objective. To promote the collection, documentation, evaluation, conservation, and utilization of genetic resources of the important species, especially in those areas where the spread of new varieties may put traditional varieties in danger of extinction, and to support training in aspects of genetic resources work. The Board largely works through other groups. It does not do research as such, but does sponsor a few research projects.

Program. The Board aims to coordinate an international effort, and to stimulate national efforts, on behalf of genetic resources. The work falls into four main categories:

- First, activities which ensure that the genetic diversity of specific crops is collected and maintained for use in future breeding programs.

- Second are efforts to support genetic resource programs in particular regions.

- Third are information activities which encourage the widespread exchange and use of the collections.

- Fourth, the Board takes responsibility for limited training programs in genetic resources techniques.

The Board's Executive Secretariat is located in and is a part of the Plant Production and Protection Division of FAO in Rome. The Board has established Crop Advisory Committees for rice, maize, sorghum and millets, beans (Phaseolus), and wheat, each of which is co-sponsored by the appropriate international center. The Board has designated most of the international centers as international repositories for the genetic materials they work with; it has also provided help - both human and financial - in establishing genetic programs at some centers (ICARDA is a current example). Ad hoc working groups are set up as necessary for other crops.

Conduct of the program involves:

- Provision of advice on technical matters by IBPGR's specialists and by means of sub contracts. (In 1979 there were 72 contracts involving 200 consultants.)

- Field missions organized directly by the Secretariat (frequently in collaboration with regional or national institutions).

- The operation of three regional programs: Mediterranean (hq. at Bari, Italy), Southeast Asia (hq. at ICARDA), and Southwest Asia (hq. in Bangkok).

- The convening of conferences, workshops, and seminars.

Individual Board members (one of whom is a USDA scientist stationed at Beltsville) are often personally involved in these activities.

Budget (rev. 1980)	- thousands of dollars -
1. Core operating	3,104
a. "Research"	1,885
b. Other[1/]	1,219
2. Core capital	-
3. Total core	3,104
4. Total special projects	-
5. Center total	3,104

- Total donors: 14
- USAID contribution to core: $750,000
- CGIAR estimate of 1981-82 inflation rate: 14%.

Country Interactions. The heart of the IBPGR program is in (a) its regional programs (noted above), (b) its efforts to help build up national programs in nations where important genetic diversity exists, and (c) its on-site germplasm collection programs (involving some 20 regions or countries in 1980). IBPGR also sponsors collaborative research with: the University of Reading, England; CSIRO, Australia; and the Royal Tropical Institute, Netherlands.

International post-graduate training on conservation and utilization of genetic resources is provided at the University of Birmingham. Short courses were also provided in three other countries in 1980.

State of Development. The Board considers that its activities have reached an appropriate plateau. It also sees itself as having a limited life, since it regards most of the world's activities in genetic resources as being ultimately the responsibility of other sources of funds (national research programs; the IARCs). It is not yet clear when this phase-out point might be reached.

Review/Plans. A CGIAR/TAC review was held in late 1979. Most of the changes proposed by the review have been put into effect. Substantial changes were made in the genetic resources information program.

The Board has asked its Secretariat to prepare a draft five year plan which was to have been reviewed by the Board earlier this year.

A technical conference, organized jointly by the Board, FAO, and UNEP will assist in the study of the long-term implications of genetic resources conservation.

1/ Training and conferences, library and documentation, general administration, general operations, other, contingency.

Major Issues. There are relatively few issues of concern. The major problems were identified in the TAC review and most have been worked out. The ones that remain are too minor to bother mentioning here.

One continuing problem arises from the backward state of many national genetic resource programs which often limits IBPGR's activities. Also some nations are getting rather xenophobic about outside groups coming in to take genetic resources.

One item that was perhaps not fully taken up in the review concerns IBPGR sponsorship and location. On one hand, some suggest that IBPGR might better be located at an international botanical institute, of which there are several in Europe (including Wageningen and Kew Gardens). This would also get it out from under the thumb of FAO - which some might feel is useful. On the other hand, some would suggest that responsibility for IBPGR shouls be shifted entirely from the CGIAR to FAO. Such a move would, of course, involve some complex financial and management issues.

While there is considerable global interest in conserving genetic resources, it is an activity that does not fall neatly in many bureaucratic stuctures. It is generally placed with agricultural research because of its importance to this process. The same situation exists within the CGIAR: it is a convenient initial location but ultimately could be sponsored by some other international group such as FAO, or to go a step further, part of its operations could conceivably be financed by existing national agricultural research programs in both developed and developing nations (as noted earlier, USDA is represented on the board). These are not issues of immediate urgency, but might play a role in long-term thinking.

THE INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE (IFPRI)
Washington, D.C.

IFPRI was established by the Ford and Rockefeller Foundations and the International Development Research Center (IDRC) of Canada in 1975. IFPRI was adopted by the Consultative Group on International Agricultural Research at its meeting in may 1979; CGIAR funding was first provided for 1980.

Objective. To identify and analyze alternative national and international strategies and policies for reducing hunger and malnutrition in the world, with primary emphasis on low-income countries and on the poorer groups in those countries.

Program. Research on four aspects of effective food policies:

- Trends Analysis Program. Identifying the scale and nature of the problem.

- Production Policy Program. Examining the factors that can improve food production.

- Consumption Policy Program. Reviewing the options for consumption policy.

- Trade Policy Program. Examining the role that can be played by international trade and aid.

Budget (rev. 1980). - thousands of dollars -

1.	Core operating	2,474
	a. Research	1,498
	Research	1,274
	Research support	224
	b. Other[1/]	976
2.	Core capital	--
3.	Total core	2,474
4.	Total special projects	--
5.	Center total	2,474

- Number of donors: 8.
- USAID contribution to core: $550,000
- CGIAR estimate of 1981-82 inflation rate for IFPRI: 12%

Senior Staff. Positions, 25. Man years, 23 (19.2 man years budgeted in 1980).

Relation to Center Economics Programs. Most of the other international centers have economics units (the one exception is ILRAD). IFPRI relates to most of these programs but does not duplicate them. It is concerned with more general governmental policy issues while the other center economists focus on

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1/ Library and documentation, general administration, general options.

economic and social issues related to the specific technologies produced at that center or prevalent in that region. Several cooperative research programs, however, are in existence or are in preparation (see next section).

Country/Center Interactions. Many of IFPRI's research projects are carried out in cooperation with developing nations. Projects as of June 1980 were:

- ASEAN Countries (Indonesia, Malaysia, the Philippines, Thailand) plus IFDC and IRRI. Rice Policy Research Project.

- Bangladesh Food for Work Project.

- India and Bangladesh. Effects of agricultural growth on the poor in terms of the expansion of their income and employment opportunities.

- Bangladesh, the Philippines and Zambia. Food subsidies and nutrition. Conducted in cooperation with FAO.

IFPRI is exploring collaboration with two other IARCs.

State of Development. Although relatively young, and many of its staff members relatively new, IFPRI is nearing its planned senior staff size (25).

Planning. Although IFPRI has not yet developed a long-term plan, progress has been made in this direction by the identification of five major policy thrusts which will weave together members of the four existing programs:

- National and international food imbalances

- Development strategy

- Agricultural production policy

- Food security

- Regional and national policies

Comment on Mode of Staffing. IFPRI's standard staffing policy is to have a relatively small number of senior staff members engaged on 5-year contracts, and a larger number of staff members from LDC's on roughly 2 year contracts. this process helps keep IFPRI in close contact with developing nations and means that LDC staff return to their home countries.

Major Issues

- Acceptance/Funding. IFPRI was originally recommended for CGIAR sponsorship by TAC in the middle 1970's. It was favored by the North American donors but opposed by the European donors. Hence, as noted in the introduction, it was initially sponsored by three North American donors. The opposition of the European donors declined over time and IFPRI was subsequently admitted to the CGIAR. IFPRI, however, receives financial support from relatively few donors, only one of which is from Europe

(Germany). This situation may represent a continuing European suspicion of IFPRI as a North American enterprise, but may also reflect the more general problem (also experienced by IFDC) of obtaining funding for an international center located in the U.S.

- Location. A related issue is whether IFPRI should move to a location in a developing nation. This matter has been discussed and reviewed at great length. IFPRI feels that there are substantial advantages for a Washington location for its kind of work (including, for example, proximity to USDA and the World Bank). There is also one real disadvantage (beyond the funding issue) and several supposed disadvantages. The real disadvantage is the lack of international status - which in turn creates problems relating to tax exampt status and visas. AID has been working for over six months on this matter with State (whose lawyers are not exactly a dynamic positive force) and at present the approach is to try to place permissive language in the foreign assistance act. Some CGIAR donors also fear that a Washington location may isolate IFPRI from LDC problems (a possibility which is offset by the staffing pattern) and lead to undue influence from donors such as ourself and the World Bank (which has not been the case). Because of such pressures, IFPRI may well leave the U.S. if it doesn't obtain international status.

- Methodology. IFPRI's present emphasis is on analytical case studies. This is probably the essential step in building up the strength of the institute but does have the initial limitation that the output of the institute appears somewhat fragmentary and location-specific. The recent definition of policy thrusts should lead to a process by which the case findings could be generalized and used by a wider audience. IFPRI plans to start issuing broader policy statements annualy which could help meet this need.

THE INTERNATIONAL SERVICE FOR NATIONAL AGRICULTURAL RESEARCH (ISNAR)
The Hague, Netherlands

Following years of study, ISNAR was established by the Consultative Group on International Agricultural Research in late 1979. The Board of Trustees was selected shortly thereafter and held its first meeting in February 1980. A director was named and the organization became operational in September 1980. Since then staff has gradually been added.

Objective. ISNAR's purpose is to help strengthen national agricultural research capabilities in developing nations. It may help in: (a) identifying research problems, (b) suggesting research strategies and policies, (c) building up institutions and other research facilities, and (d) promoting specific national or regional research programs. The goal is to enable developing countries to plan, organize, manage, and execute research more effectively utilizing their own resources. ISNAR will form a link between the CGIAR centers and national research programs.

Program. Details of ISNAR's program are still being developed. ISNAR's services will be available to any developing country. One of its major functions will be to identify the most serious research gaps, diagnose weaknesses in programs, and propose measures for improvement. When it comes to the execution stage, ISNAR will normally seek the service of existing international or national agencies. Only in exceptional cases will ISNAR assume operational responsibilities; these will require the approval of the Board of Trustees and will be undertaken only if costs are fully covered from non-core funding.

Budget (rev. 1980)		thousands of dollars -
1.	Core operating	1,094
	Research	138
	Other1/	956
2.	Core capital	105
3.	Total core	1,199
4.	Total special projects	---
5.	Center total	1,199

- Number of donors: 10
- USAID contribution to core: $250,000
- CGAIR estimate of 1981-82 inflation for ISNAR: 11% (ISNAR estimates 9.5%)

Senior Staff. It is planned to have nine senior professionals engaged by the end of 1981.

1/ Training and conferences, library and documentation, general administration, general operations, other, and contingencies.

Major Issues. One of ISNAR's first and most important tasks will be to decide what projects it will initially undertake. What kind of balance should be struck between possible projects with a high and low probability of success? The need for ISNAR's help may well be inversely proportional to the chance of success. The more difficult projects may also require more time. If ISNAR does get off to a good start, demands for its services are likely to far exceed its resources. ISNAR's management is likely to be continually on a hot seat.

Related matters may eventually concern: the degree to which ISNAR becomes involved in special projects, the degree to which its experiences in individual countries are public information; and the extent to which it becomes involved in research on national research. These, however, are matters which the Board will have to sort out over time.

When ISNAR was initially proposed, it did not receive strong support from BIFAD and some AID regional bureaus. But as the need for, and nature of, ISNAR's program became more clearly defined the opposition appeared to decrease. We are not aware of any particular concerns of either group at this point. We think, in fact, that ISNAR will be a highly complementary activity. We will deep a close eye on it (and plan to send an observer to the next Board meeting).

THE ASIAN VEGETABLE RESEARCH AND DEVELOPMENT CENTER (AVRDC)
Shanhua, Tainan, Taiwan

AVRDC was organized in 1971 and research began in late 1972. USAID played a prominent role at all stages in the development and establishment of the center. AVRDC is not a member of the CGIAR.

Objective: To increase the yield and nutritional value of selected vegetable crops which can (a) make significant contributions to improved staple diets and (b) increase total food production per unit of area in the lowland humid tropics. These aims are being accomplished through the development of improved germplasm (varieties) and appropriate crop technology.

Program. Research and training in:

- Legume crops. Soybeans and mungbeans.
- Horticultural crops. Tomato, sweet potato, Chinese cabbage.
- Related aspects of nutrition, environment, and management.

Budget (Proposed (1981)[1/]	- thousands of dollars -
1. Core operating	2,922.4
a. Research	979.7
Legume Crops Program	311.9
Horticultural Crops Program	353.0
Nutrition , Environment and Management	314.8
b. Training, communication and research services	565.5
c. Administration	337.9
d. Operation support	298.4
e. Other (gen. exp., contingency)	740.9
2. Core capital (equipment	130.2
3. Total core	3,052.6[2/]

At present, core funding totaling $2,815 million appears likely, plus support for several scientists - principally under special projects. Six donors will be involved in core funding: Taiwan $1.6 million; USAID $700,000[3/]; Philippines $150,000; Thailand $150,000; Korea $115,000; and Japan $100,000 (plus one or two scientists). In addition, the following groups have or are expected to sponsor scientists at AVRDC: USDA, a pathologist to work on soybean rust, USAID is sponsoring a nutritionist, Germany (GTZ) a virologist, and the Rockefeller Foundation, a sociologist.

1/ Since AVRDC is not a member of the CGIAR, it does not follow exactly the same budget format. The budget has, however been reconstructed in roughly the same format.

2/ Excludes salaries of five scientists provided by special outside funding.

3/ This represents an increase from AID's typical previous annual contribution of $600,000 and reflects the increase in matching funds provided by other donors. It maintains AID's proportion at 25%.

Stage of Development. AVRDC is now relatively fully developed. Its research programs, though modestly funded, are productive and improved varieties and practices are now flowing to national programs. Tropical tomato varieties have been released in several nations and improved soybean varieties are expected to be released in several other nations.

Off-Campus Outreach Activities. AVRDC is becoming more active in off-campus outreach activities. AVRDC's first such project was funded by the Asian Development Bank in the Philippines and Korea. The principal activities involved the exchange of students and of germplasm.. A proposal for such a program has been submitted to Indonesia, and negotiations are in progress for Malaysia, Papua New Guinea, the Seychelles, and the West Indies. Discussions have been initiated for a program in India. An agreement has been signed with CATIE in Costa Rica for a joint program to improve the status of small farmers. Whether some of these projects are realized will depend on the availability of funding.

In a related development, AVRDC has recently signed a contract with SEAROA in the Philippines to open an Asian Laision Office.

Training. AVRDC training facilities are now being used to capacity. In 1979 there were 65 graduates representing 11 countries. The number of participating countries is increasing. Countries recently added include Guatemala, Panama, Peru, and Ghana. Applications are in hand from El Salvador, Honduras, and India. AVRDC is now constrained by the lack of housing.

Major Issues. AVRDC is not a member of the CGIAR because of political problems arising from its location in Taiwan. For many years, the CGIAR has been struggling with the question of whether to set up a separate vegatable research center in another more politically acceptable nation, but nothing has come of this (and is not likely to).[4/] In the interim, AVRDC has been doing a fine job on a limited budget. Its virtues are becoming widely known, and the earlier political problems appear to be easing somewhat. In particular, AVRDC scientists have established indirect working contacts with scientists in the People's Republic of China; materials are exchanged through third parties and PRC representatives recently attended an AVRDC-sponsored conference in Japan. As yet, though, it has not been possible to obtain a visa for a PRC scientist to visit AVRDC (no one from the PRC has received a visa to visit Taiwan).

4/ The CGIAR has had difficulty in agreeing on the list of vegetables which should be covered and in determining the best location to carry this work out. A number of organizational procedures have also been considered, none of which seem entirely acceptable. Even if agreement could be reached on these points, it would probably be difficult to obtain sufficient capital to construct a station.

With some easing of the political question, AVRDC seems to be having greater success in attracting trainees and in arranging for outreach programs. And while existing donors are increasing funding somewhat, funds are still short. No new donors have yet appeared. AVRDC has a new director who is pursuing increased funding with great vigor. Japan is a particular target. We do not know how well he has succeeded.

While we in AID are well pleased with AVRDC's progress, we have had some clearance problems with the Taiwan Affairs Desk in State. The overall U.S. posture toward Taiwan is uncertain, and this is reflected in a lack of crisp action by the desk. For example, in early December 1980 we asked for clearance on our proposal to contribute up to $700,000 to AVRDC in 1981; clearance was not received until late March. In between were several meetings and many phone calls. Perhaps, however, this process has cleared the way and things will not move so slowly next year.

Other linkages are good. A USDA scientist of Chinese birth stationed at Beltsville is on the AVRDC Board. We keep in contact with him and had him come in for a meeting with the Taiwan Affairs desk. Earlier in the year we met with the new director and subsequently with a high Taiwanese agricultural official concerned with AVRDC. AVRDC and INTSOY have long-established contacts.

As for the future, we hope that the political problems associated with AVRDC's location in Taiwan will continue to ease and that in time it will be possible to propose it for membership in the CGIAR. In the interim we would take to active role in promoting additional vegetable work in the CGIAR.

If it appears that AVRDC will continue indefinitely and that U.S. will continue support at a 25% level, we ought to encourage a quinquennial review. (The Board wanted to do one in 1980.) We should encourage a close look at both the research subjects (crops and problems on crops) and the research methods.

International Fertilizer Development Center (IFDC)
Muscle Shoals, Alabama

IFDC was started as the direct result of a U.S. Government initiative. It was incorporated in 1974 in fulfillment of a pledge by the Secretary of State before a combined meeting of the United Nations General Assembly and the Organization of American States. Funds to organize the center were contributed by A.I.D. and the International Development Research Centre of Canada. The need for such a center was dramatized by the coincidence of food, fertilizer and fuel shortages of 1973-74.

IFDC is to find ways for farmers of developing countries to meet their crop/soil nutrient requirements as economically as possible.

IFDC's five principal functions are:

1) doing research on the production, distribution and use of fertilizer in the developing countries with emphasis on the tropics and subtropics,

2) developing products, processes and techniques suitable for use in developing countries and, where possible, employing the natural resources found within those countries,

3) training people to work in all phases of the fertilizer supply system, including field research and farm demonstrations,

4) providing technical assistance to developing countries in raw material identification, feasibility recommendations, process selection and development, factory operations, trouble-shooting as well as assistance in logistics, marketing and sales,

5) serving as a clearinghouse for information on supply, demand and consumption of fertilizer in the developing countries.

Accomplishments: A. Research and Development. IFDC has: 1) made notable contributions to understanding the losses of nitrogen from fertilizer applied to rice paddies, 2) determined the appropriate uses for some 100 phosphate ores, 3) developed a technology for production of urea super granules, which when precisely placed will double the efficiency of urea applied to rice, 4) devised methods for granulating soluble salts (ammonium sulfate and potassium chloride) and insoluble materials (rock phosphate) so that they store, handle and mix better and can be spread more easily and uniformly by the farmer without a loss of effectiveness in producing better yields, 5) developed processes for using phosphate ores not suitable for conventional manufacturing technology and developed new processes for salvaging the phosphate from slimes being discarded and creating an environmental problem.

B. Training. During the past year, March 1980 through February 1981, 269 participants from 39 countries have been trained by IFDC. Five formal courses were given overseas: 1) Brazil - An update of fertilizer manufacturing technology, factory operations and management, 2 & 3) Colombia and Kenya - Regional workshops on research techniques for measuring the efficiency of fertilizer, 4) India - Southeast Asia regional seminar on fertilizer marketing, 5) Thailand - Regional meeting on gradulation technology and compound fertilizer formulation. Two major courses were offered at IFDC headquarters in Muscle Shoals, Alabama. One covered factory maintenance to minimize production losses and the other a six week course on fertilizer marketing and use.

C. Technical Assistance: Technical assistance by IFDC assures utilization of the research and development work and improves the efficiency of factory and distribution systems in the developing countries.

When a prilling tower at the PUSRI urea factory in Palambang, Indonesia needed to be replaced, IFDC recommended substituting a pan granulator. This innovation was less costly and permitted making urea granules in a range of sizes to permit better storage, blending and efficiency in field use. IFDC suggested the design of the granulator, worked with the equipment supplier, and provided training for the supervising engineers at the IFDC pilot plant before the production unit was installed in Indonesia. IFDC supplied engineers to assist in the startup of the plant and train additional operating personnel. Within three weeks the unit was working at rated capacity.

In Brazil, guidance of one IFDC engineer increased the output of a granulating plant from 1200 to 2000 tons per day without modification of the equipment.

A feasibility study for the Government of Nigeria has provided a blueprint for development of the fertilizer industry for the entire country.

Work with a factory in Colombia has permitted the substitution of 95 percent local phosphate rock for imported rock, saving foreign exchange and increasing local employment. Previously not more than five percent of local rock could be used without a serious loss in product quality.

Characteristics: IFDC is an international research and educational center both functionally and legally. It was formally recognized as an international organization by the President in an Executive Order on March 14, 1977. The Board of Directors, (Dr. John Hannah, Chairman), has nine members from other countries and three from the U.S. Six are from developing countries. All major geographic regions are represented. The professional staff at IFDC includes 30 non-U.S. nationals from 16 countries. The staff counts 75 scientists, engineers and administrative officers and 96 support personnel, many with highly specialized skills.

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Funding: Since 1978 AID's contribution to the operating budget has been constant at $4,000,000 per year. The same amount is budgeted for FY 1982. Other donors and contract earnings have financed an increasing portion of the program. For Calander Year 1981, IFDC anticipates total income of $8,400,000. The AID grant will account for less than half of the Center funding this year for the first time. (See Table 1) While the IFDC budget is projected to research $12,855,000 by 1986, no increase above the current AID grant of $4,000,000 per year is anticipated.

Capital Development: IFDC needs a warehouse ($300,000) and building alterations to provide more space for the word processing unit ($100,000). A new gertilizer granulation and coating pilot plant is needed ($1,000,000).

Interactions: While providing training, technical assistance or conducting research, IFDC staff made 117 trips to 34 countries in the last 12 months. Six professionals were on long-term research assighments outside the U.S.; two in Colombia at Centro Internacional de Agricultura Tropical (CIAT), one in the Philippines at International Rice Institute (IRRI), one completed a tour in Guatemala and one began a two year tour in India at International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). All but one are on special project funds. Two full-time employees are stationed in Bangladesh working on the fertilizer marketing system under contract with Bangladesh Agricultural Development Corporation.

Through research, training and technical assistance, IFDC is strengthening national institutions in assessing their own fertilizer needs. With IRRI, IFDC does cooperative research on fertilizer for rice in 11 countries. IFDC helps in the design and management of trials to determine interactions among various fertilizers on a range of soils in the agro-ecological zones of the Asia-Pacific Region. In Colombia, IFDC and the CIAT provided training for field agronomists from 28 countries in field plot layout, care, harvesting and data analysis to develop fertilizer recommendations in their own countries. IFDC specialists evaluated the soil testing program in Venezuela, advised on collation of the data and helped develop fertilizer recommendations for specific crops in various climate regions within the country. IFDC worked with the Hindustan Fertilizer Corporation in India laying out some 150 trials to assist the industrial agronomists formulate better fertilizer recommendations and better understand the nature of the products their company produces. IFDC is cooperating in phosphate research at CIAT and nitrogen research at IRRI and the United Nations (FAO and United Nations Industrial Development Organization (UNIDO) and provides assistance to the World Bank.

Issues: There are two principal issues concerning IFDC and AID's funding for IFDC. The first is dependence of IFDC on AID grant support. The second is the possibility that IFDC is duplicating work done by other organizations.

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Table 1 IFDC GRANTS AND CONTRACTS BY CALENDAR YEAR *

Source	YEAR 1978	1979	1980	1981	1982
Unrestricted					
Philippines	10,000		10,000	10,000	10,000
Israel	50,000	50,000	25,000	75,000	75,000
Spain	12,000				
Rockefeller Foundation	11,870				
A.I.D.	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
Restricted Grants & Contracts					
IDRC - Canada		332,180	587,000		
UNDP		2,635,000			
ADAB - Australia			175,570	260,000	400,000
GTZ - Germany		139,215		6,244	
DITH - The Netherlands	103,869				
Other	450,757	2,108,985	733,961	738,693	1,438,529
TOTAL	4,638,496	9,265,380	5,531,531	5,089,937	5,923,529

*Budgeted expenditures are normally made after grant is received. UNDP grant for example covers three years' activity with largest use in 1981.

Issue 1. IFDC and CGIAR and AID Funding. Lack of broad-based financial support was a concern raised even before IFDC was formed and the dominance of AID grant funding remains an issue today. Other donors have not been attracted as soon as IFDC and AID expected. However, substantial progress has been made (Table 1).

From the beginning of IFDC, AID has encouraged the Consultative Group for International Agricultural Research (CGIAR) to sponsor IFDC. CGIAR has been unwilling to accept IFDC as a member but has endorsed its objectives and program. IFDC was created on the initative of the U.S. Its location in the U.S. may be the principal reason many donors are unwilling to accept it in the CGIAR. Many CGIAR members felt that the commodity orientation of the other centers was the appropriate model and were reluctant to admit the Fertilizer Center which has no specific crop focus. Recently, the rapid rise in the cost of the Centers has been a factor. Some donors, (U.K., France, Netherlands) note that they fund research centers located in their countries whose work primarily or fully benefits developing nations and they think the U.S. should fund IFDC.

CGIAR supported the concept of IFDC and encouraged the Centers to cooperate with it. CGIAR formally noted and approved of the creation of IFDC by the U.S. It was considering the formation of an international plant nutrition institution at the time and is still trying to decide its appropriate involvement in this area. The CGIAR has invited IFDC to report at all its meetings and nominate three members of the IFDC Board of Directors. AID first informally, then formally, proposed IFDC as a full participating member in the CGIAR Center network. TAC's expert panel reviewed the objectives and ongoing program at IFDC and strongly recommended adoption. TAC did not endorse the expert panel's recommendation, citing the objections noted above. When the issue came before the CGIAR as a whole, it was apparent that a concensus for acceptance of IFDC could not be obtained. Rather than reject IFDC altogether, the CGIAR referred the issue back to TAC to consider IFDC as a component of the eventual program in plant nutrition. This TAC study is now in progress and it may recommend CGIAR sponsorship of IFDC.

Issue 2. Duplication of Effort. TVA has the only fertilizer program comparable to that of IFDC but it is limited by work directly benefitting the U.S. TVA has little interest in fertilizers having special advantages for tropical soils and tropical crops. TVA is not concerned about minor phosphate desposits nor deposits which have characteristics different from extensive commercial ore bodies in the U.S. Such ores may be of critical importance to a developing country with low requirements and are therefore of prime interest to IFDC.

TVA is seeking technology appropriate for large U.S. industry. This technology is available to developing countries through IFDC but IFDC is not involved in research and development of nitrogen fertilizer production technology. TVA has the most outstanding fertilizer library in the world. IFDC (and through it) developing countries have access to that library but IFDC has no intention of duplicating it.

Similarly, the specialized agencies of the United Nations, the U.N. Industrial Development Organization (UNIDO) and the Food and Agriculture Organization of the U.N. (FAO) have related programs. Statistical complication and reporting are major functions of these two agencies. IFDC, TVA, and World Bank all cooperate with them in assessing fertilizer supply, demand and trade and research and development capability. UNIDO gives technical assistance through short-term consultants. UNIDO has no training capability, IFDC provides training in all phases of fertilizer production, distribution and use. IFDC cooperates with FAO on demonstrations and training for fertilizer market use. Primary interest at FAO is promotion of the use of conventional products. IFDC's primary interest is on the development, testing and introduction of new products with new and more effective ways to use them. FAO and IFDC are working on the economics of fertilizer use but this is such a large and complex area of study that there is little likelihood of duplication of effort.

The World Bank conducts feasibility studies for projects which it may finance but even on these has drawn on IFDC. For other projects, and especially small development projects, IFDC is the only source which provides an assessment of engineering, commercial and agronomic feasibility with its own staff. IFDC is not limited to its full-time staff capability. It draws on other qualified experts, most notably from among the 300 scientists and engineers at TVA.

International Center for Insect Physiology and Ecology (ICIPE)
Nairobi, Kenya

ICIPE is a young research institute on the campus of the University of Nairobi, Kenya. Its mandate is to:

(a) Do high quality research that will lead to the design of novel methods for the control of major pests in a long-range selective manner within an acceptable ecological framework; and

(b) Do high-level technical and scientific training of young, gifted scientists and senior technicians from Africa and other developing countries in the field of insect science.

The objectives of ICIPE are:

(a) To promote and do research into insect science, including fundamental questions in insect physiology, endocrinology, genetics, biochemistry, natural products chemistry, biophysics, ecology, epidemiology, and other areas that promise breakthroughs important for the design of new pest management systems of the beneficial use of insects;

(b) To provide advanced training in research methodology;

(c) To provide an international forum for exchange of knowledge on insect science; and

(d) To foster the growth of the scientific community in the developing tropical countries, especially in Africa.

ICIPE Budgets ($ millions)

	1978	1979	1980e	1981p	1982p	1983p	1984p
Operations	3.05	4.81	5.1	8.0	8.3	8.7	8.8
Capital	1.45	1.75	2.4	0.4*	0.3	-	-
Total	4.50	6.56	7.5	8.4	8.6	-	-

e - estimated, p - proposed
* - capital development costs of ICIPE's main campus were roughly estimated at $14.3 million in 1979.

ICIPE's major donors in 1980 were UNDP, Sweden, Denmark, UNEP, WHO, Australia, France, United States, Kenya, Netherlands, Belgium, IFAD, OPEC, and U.K. UNDP, Sweden and Denmark funds were unrestricted core operations; OPEC, Norway and U.K. contributed capital funds; others were restricted core operations.

AID has two current research grants with ICIPE. A DS/AGR grant for tick research supplies $364,000 over three years and ends in Sept., 1981. Although the work has gone well and more work obviously needs doing, DS/AGR plans to put no more money in before 1983. Another grant is administered by the Africa Bureau (REDSO/EA) and provides $500,000 over two years for research on the basis of plant resistance to insects. That grant also ends in late 1981. That work is also progressing well. Future AID funding of work at ICIPE is being reviewed by the several concerned offices.

ICIPE has a current total principal staff (research scientists and above) of about 43.5 man years. Of that, 31 man years are expended on the seven major research programs, 6 in supporting research and 7 on other services and management. ICIPE has five training programs to build scientific and technical capabilities for developing countries and the ICIPE professionals. These programs are: (1) Graduate and Postdoctoral, (2) Training for Practitioners; (3) Communication, (4) Maturation for Scientific Career, and (5) Personnel Development. The training ($405,000) output at the ICIPE during 1979 amounted to a total of 41.89 man years. About 75 percent of that was for the benefit of the ICIPE staff and 25 percent for scientists from other institutions in East Africa and the world.

ICIPE is not a member of CGIAR. After a prolonged courtship, ICIPE applied for membership in CGIAR in 1980. TAC had been fairly well informed of ICIPE's work, but did a special review in response to ICIPE's request for CGIAR inclusion. TAC recognized ICIPE's high professional quality and scientific achievements. TAC noted its ability to attract financing from international donors and opined that ICIPE would be able to continue attracting money. TAC noted that CGIAR had repeatedly said it could not and should not aspire to encompass all lines of research, and that many excellent and important lines of research should seek financial support outside CGIAR. TAC considered ICIPE's potential for contributing to the near-term objectives of CGIAR, and the relative priority of ICIPE's activities in the broader context of crop protection and animal health. It noted ICIPE's distinctive role in basic research on insect structure, physiology, host relations, and response to its environment, and that other aspects of insect science, and pathology, microbiology, virology, and other disciplines not covered at ICIPE were as important as insect physiology and ecology. TAC concluded that compared to other important research areas under consideration, ICIPE would not be among TAC's first choices to recommend to CGIAR.

In November, 1980 the donor members of CGIAR opposed to including ICIPE represented a scant majority and about 65 percent of the CGIAR money. The CGIAR concluded that there was not a sufficiently strong consensus to warrant adoption of ICIPE. Instead, under World Bank leadership, a group of donors will meet regularly to provide a stable financial base for ICIPE and to arrange for reviews of its program.

AID reviewed ICIPE's program and opposed membership in CGIAR for ICIPE because ICIPE's mandate and research programs were not sufficiently focused on solving developing country problems to warrant AID support of its core program. Also, research in insect physiology and ecology were not obviously of higher priority for Africa than similar research in other disciplines. At the CGIAR meeting we affirmed our recognition of the potential contributions of ICIPE and our intention in principle to continue funding high priority research projects at ICIPE. The portion of the decision memorandum regarding ICIPE is attached as Annex ___.

ICIPE is a popular institution with a persuasive director. If it finds its current position suboptimal it will likely reapply for CGIAR inclusion. The U.S. would want to reappraise its position if some time had elapsed, but there are no obvious new considerations regarding ICIPE at this time.

1980 Budget

	MY	$000
Research		3151
Tsetse	9.25	630
Bases Plant Resistance	3.0	353
Crop Borers	3.6	358
African Armyworm	2.0	175
Grassland Termites	5.25	366
Livestock Ticks	3.0	305
Chemistry	1.0	190
Medical Vectors	5.0	323
Histology	1.25	172
Sensory Physiology	1.5	152
Bioassay	1.5	127
Field Stations		296
Training, Library, etc.		994
Research Support		775
Management		1011
Total Operations		6227
Capital		2400

International Soybean Program (INTSOY)
Champaign, Illinois

AID and Rockefeller Foundation began supporting international demonstration and technical service activities on soybeans at the University of Illinois in 1971. Variety testing had expanded to 33 countries when the International Soybean Program (INTSOY) was formed in 1973. The University of Illinois and the University of Puerto Rico work cooperatively in INTSOY but the AID contract is with U. of Illinois. Both universities received grants (211d) to strengthen their international response capability for soybeans. The current INTSOY program costs AID about $825,000 per year. There are no other donors to INTSOY's core program.

The core program focuses on applied research on the constraints to production of soybeans in the tropics and subtropics. Rsearch to improve the acceptability of soybeans as food for low income people was deleted from the core research project by the RAC in 1976. . International soybean variety trials have been done in 110 countries. In a typical year 140 trials are done in 70 countries.

INTSOY gives broad distribution to its technical publication series and a newsletter goes to 1700 people. Three regional soybean conferences have been held as have workshops on soybean rust, irrigated production and seed quality.

Annual practical training courses include soybean processing for food and soybean production. Degree courses of study are offered by both Universities.

INTSOY has been involved in several country development programs. AID has funded long term work in Peru and UNDP and other UN agencies have funded a long-term project in Sri Lanka. Shorter term work, sometimes near a year, has been funded by AID and other donors in several countries. INTSOY has defined working relationships with IITA, AVRDC, Korea, Philippines, Brazil, Ecuador and IADS.

In 1973, TAC considered a University of Illinois proposal for establishing INTSOY as an international center. TAC supported the proposal but it was not approved by CGIAR. INTSOY was funded by AID that year. In 1977, TAC considered proposals for the establishment of both an international soybean research consortium and a board, but TAC did not recommend either the consortium or board to CGIAR. TAC did "reaffirm its conviction that some suitable approach should be worked out to enable the CGIAR to support work which would lead toward the effective exploitation of the potential of this crop for tropical developing countries, and (TAC) will continue to explore the matter actively."

In 1980, the Land of Lincoln Soybean Association (a producers and seedsmen association) with the advice of the University of Illinois, formed a Committee for the Establishment of an International Soybean Center. The Committee has a salaried Executive Secretary, paid by the Illinois Soybean Program Operating Board. The Committee has developed a policy statement on the mission, functions, governance, funding, and location of a proposed Center.

As proposed, the Center would intend to exploit the potential of the soybean. It would initiate and conduct research, training, and extension activities to enhance the contribution of soybeans to meet global needs for food, feed and other soybean products. The Center's program would include soybean use, production, marketing, storage, processing, country programs and training. The Center would be governed by a board of trustees and be organized as a non-profit international organization. Subject to the international planning activity, the administrative center for the center is envisioned to be located at Champaign, Illinois. The Committee has discussed, with AID and others, the funding of a major planning and organizing effort. The effort would take two years and cost $510,000. Their plan would approximately parallel the formative work done by a sponsor when CGIAR starts a new center.

Issue 1. Does soybean have sufficient potential for the developing countries to warrant donor agencies making a significantly larger investment in soybean research and training?

Half the world's soybean area is in the U.S. China has two-thirds and Brazil has about 30 percent of the soybeans in the developing nations. Indonesia (with 650,000 ha) Nigeria (200,000 ha), India (450,000 ha), South Korea (280,000 ha) and Thailand (100,000 ha) are the developing countries with significant soybean areas. Soybeans are thus not now an important crop in most developing countries. As a direct food crop, soybeans would be an efficient source of calories and protein in some locations, but in many places they would be a new food. They are an efficient source of edible oil when they can be solvent processed and the meal has about the same economic value as the oil. If price for diesel fuel increases (by a few cents a pound) in relation to edible oil, soybean oil may be used as diesel fuel in some countries.

Issue 2 - If the donors should be investing more in soybean technology should the U.S. assume that other donors will invest significantly in soybeans or will the U.S. have to fund the whole program?

The U.S. is by far the leading technical source on soybeans. Brazil is developing this area rapidly and India could become significant. If the continental U.S. is chosen as a site for an international effort other donors are not likely to welcome it into CGIAR or help fund it. (Only Germany, Australia, and the Philippines have joined in funding the IFPRI.) Instead of trying to hassle a new soybean effort into CGIAR we might better form a small donor group outside the CG and keep the CG informed.

ICLARM

The International Center for Living Aquatic Resources Management was established as an independent, autonomous, nonprofit international scientific research center under the laws of the Philippines, in Manila, in January 1977. ICLARM was organized to conduct, stimulate and accelerate research on the development and management of living aquatic resources. Its main objective is to assist developing countries in meeting their nutritive, economic and social needs. For a number of years prior to 1977, many people involved with the international aspects of fisheries had been concerned at the lack of an apparatus that could carry out coordianted long-term research on global problems affecting the rational use of aquatic resources in the developing world.

The Rockefeller Foundation recognized this lack and convened a series of meetings that led to the establishment of ICLARM initially as an operational program of the Rockefeller Foundation, originally located in Honolulu Hawaii and later moved to Manila. The interests of ICLARM are worldwide. However, initially the Center's primary attention is being directed to southeast Asia and the Pacific. There are no physical facilities, other than offices in Manila, for a staff of 8 permanent and 7 fixed term professional. ICLARM is presently in the process of staffing up to 12 permanent professional positions. The objective of ICLARM's program is to identify and obtain support for comprehensive, cooperative, international programs sufficiently broad in scope and cohesive in nature, to overcome relevant scientific, social, cultural, and economic constraints that are now beyond the resources of any one institute. It provides technical and financial support to cooperating centers, seeks to further the training of technical, scientific and management personnel, and strengthen those cooperating institutions located in developing countries upon which the long-term burden of fisheries development and management must eventually fall. ICLARM's present core program is focused on four areas: aquaculture; traditional fisheries; resource development and management and marine affairs; and education and training.

Current project funding and staff, for 1981 in these four program areas are:

<u>Aquaculture</u> - $810,000 - 3 permanent, 3 fixed term staff

- Applied research on integrated animal/fish farming.
- The genetic improvement of tilapia broodstock in the Philippines.
- Cooperative program of research and training in aquaculture and inland fisheries.
- Milkfish production economics.
- Catfish production economics.

<u>Traditional Fisheries</u> - $213,000 - 1 permanent, 1 fixed term staff

- Skipjack tuna and traditional fisheries: a Solomon Islands core study.
- Malaysian traditional fisheries: options for development.
- Small-scale fisheries of San Miguel Bay, Philippines: A multidisciplinary analysis.

Resource Development and Management, and Marine Affairs - $222,000 - 2 permanent staff

- Research on stock assessment.

Education and Training - $32,000 - no staff

- Graduate study program in aquatic resources.
- In-service training.

Projected Budget 1978-1984 ($000)

1978	1979	1980	1981	1982	1983	1984
623	904	1,154	1,790	1,921	2,103	2,340

The budget figures through 1981 are firm; those for 1982 to 1984 are anticipated based on commitments agreed to to date. Contributors for 1981 are as follows: Rockefeller Foundation $910,000, USAID $275,000 (prorated), Federal Republic of Germany $250,000, Government of Australia $51,000, Government of Thailand $63,000, Government of Canada $25,000, Asian Development Bank $70,000, and other cooperating institutions $146,000. In addition commitments have been made by the Governments of Sweden, the Netherlands and the Philippines for contributions in subsequent years.

ICLARM addresses major technical and socio-economic constraints to production through cooperative research networks and linkages comprised of institutes in developing and developed countries (e.g. research institutes in the Philippines, Thailand, and Indonesia and the Southeast Asian Fisheries Development Center). It seeks the constructive participation of experts wherever they may be to help achieve its objectives.

Most projects consist of cooperative research involving ICLARM scientists and implemented with other fisheries institutions, including the Southeast Asian Fisheries Development Center (SEAFDEC), the Department of Technical and Economic Cooperation and Department of Fisheries (Thailand), Kasetsart University, Research and Development Institute (Thailand), the Fishery Industry Development Council and Bureau of Agricultural Economics (Philippines), Central Luzon State University (Philippines), Ministry of Natural Resources (Philippines), Philippine Council for Agriculture and Resources Research (Philippines), the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (Philippines), and a number of others on a less formal basis. In this manner ICLARM, with a small staff and modest budget is demonstrating a new international Center concept of implementing programs with other established fishery institutions, rather than on a center-controlled research station. This promises to achieve research and development at considerably less cost than can such established international centers as IITA, IRRI, and CIMMYT.

ICLARM, as a non-governmental, international center with no physical research facilities is distinguished from SEAFDEC, which is a Regional Organization composed of the fisheries departments of its member governments (Thailand, Singapore, Malaysia, Philippines and Japan). SEAFDEC has three fishery research laboratories and two ocean-going research vessels. This has provided the opportunity for cooperative programs and activities between SEAFDEC and ICLARM in Southeast Asia in a manner such that the attributes of each organization have complemented and reinforced one another.

Longer term plans call for expanding ICLARM's activities to other countries and regions of the world and addressing problem areas pertinent to developing countries in those areas. This may include the establishment of sub-centers in appropriate locations.

AID became involved with ICLARM by virtue of a recommendation that resulted in an action memorandum approved on May 16, 1977 by Curtis Farrar, Assistant Administrator for Technical Assistance. The memorandum proposed that AID provide financial support to ICLARM in the amount of $1,500,000 over a five-year period, with an initial three-year grant of $800,000 to be used for core program funding and the remainder to be allocated in the final two years. The initial $800,000 has now been provided to ICLARM, over a three-year period, with the final $300,000 increment being approved after a September, 1980 project reveiw found significant and satisfactory program on the part of ICLARM in achieving its original goals (a condition of the third year funding of the initial grant).

The major issue is that no funding is provided for, at present, in the AID budget for FY82. This is in spite of the fact that the summary statements in February 27, 1979 Action Memorandum signed by the Deputy Assistant Administrator, Mr. Babb, approving the initial three-year $800,000 grant stated "... continued funding after this three-year period will be contingent on an evaluation of the quality of the program implemented during the grant period and upon obtaining other substantial international core financial commitments ... Currently, we believe we could renew the grant for an initial two years through 1984 if that much time is necessary ..." Further on January 9, 1981, Mr. Babb wrote to Dr. Ziad Shehadeh, Director-General of ICLARM stating: "We expect to review Project 931-1050 again in October, 1981. During that review AID will be particularly attentive to the progress made on the recommendations resulting from the September 1980 review."

In the September, 1980 AID review of ICLARM a number of points were raised, in the form of recommendations:

- ICLARM should develop for the support of its core expenses by additional individual host-country donors, with private foundations, and with private enterprises.

- In order to justify AID support to ICLARM similar to that provided to the International Agricultural Research Centers, ICLARM should continue its effort to obtain membership in the CGIAR and gain at least an indication that its membership will be considered at a specific future date.

- Mainland China's fisheries research and development institutions should be approached to discuss the possibility of their participation in the international fisheries network.

- Within the Philippines, ICLARM should make a major effort to encourage better planning and coordination between the different foreign and domestic fisheries agencies, including: SEAFDEC, FAO, UNDP, USAID, the World Bank and the Asian Development Bank.

- ICLARM should take greater advantage of the US university competency in international fisheries development and should explore the possibility of cooperation in the pond dynamics and stock assessment CRSPs.

The Tropical Agricultural Research and Training Center (CATIE)

CATIE is a non-profit organization to stimulate research and training in agriculture, forestry and animal production. It was established in 1973 by the Inter-American Institute of Agricultural Sciences (IICA), a component of the Organization of American States. Its headquarters is at Turrialba, Costa Rica. CATIE expects its influence to extend from Panama through Guatemala including all the countries in between. CATIE's purpose is to increase agricultural, livestock and forestry productivity, especially that of the small farmers of the area, to contribute to the improvement of their living standards. Specifically, it promotes research in cooperation with national institutions to develop useful farm level technology. It promotes training in coordination with national institutions and cooperates with them in the testing of models to accelerate technology transfer to the farmers.

CATIE maintains a basic core of professionals at the Turrialba center. In 1978 CATIE had 63 professionals, 27 were in annual crops, 3 in perennial plants, 11 in natural renewable resources, 16 in animal production, and 2 in training and technical cooperation. The 63 professionals were from 20 countries. Twenty-nine had a doctorate, 22 a masters and 12 a bachelors or equivalent degree.

CATIE has 1,000 hectares of land with 900 hectares in Turrialba and 100 in the province of Limon, where they do cocoa research. The facilities at Turrialba include research, training, laboratories, glass houses, and housing for the technical staff and guests. They have facilities for 50 students. The center has one of best agricultural libraries in Latin America. It has a computer unit and has connections with the University of Costa Rica and the central unit of IBM in Mexico.

In 1973 CATIE's budget was about $1.4 million. By 1978 it was $5.2 million and in 1979 it was nearly $8 million. Two-thirds of the $8 million was in special projects and about one-fourth was in core budget. The sources of funds for CATIE include the European Economic Community, FAO, German AID, Inter-American Development Bank, IDRC, USAID, Netherlands, United Kingdom and a number of others. Specific information on the contributions of each donor is not available A recent report states that specific projects are funded by governments of the region and that component of CATIE's budget has grown rapidly. CATIE has working relationships with several international centers including CIAT, CIMMYT, IRRI and IITA.

CATIE has developed a reputation for working in close cooperation with its constituent nations and in doing research at the farm level in coopration with national research institutions. Further, CATIE's research is highly farming system structured and the various components of the farming system are considered as research on each of its components proceeds. Many well-informed persons have high regard for CATIE and its program as it helps the nations of

Central America develop their agricultural technology. Many consider that, given the limited agricultural base in each of the countries in Central America, a regional organization such as CATIE will be essential for maintaining an economic flow of technology to serve the farmers of these nations. The dominance of a single entity such as CATIE need not be assumed. There are other informal organizations (including one of Central American plant breeders) that have effectively enhanced exchange of information among scientists of the region. There is broad consensus, however, that CATIE is useful and that, while special project moneys are very useful, CATIE needs a substantial core budget to assure that its staff and core research program are funded efficiently.

CATIE is one of the better known and more successful regional institutions dealing with agricultural technology, but it is not the only one. There is a similar organization in the Caribbean and there are similar organizations in Asia. WARDA is a quite similar organization in West Africa. Each of these organizations would be well served by the formation of a group of donors that intended to support that organization over the longer term. The United States should promote the development of a consortium of donors for CATIE, another consortium of donors for WARDA, etc. There seems to be no great reason at this time to promote the formation of a consultative group of donors to regional agricultural technology organizations. The needed exchange of ideas on program structure, management, relationships with constituent countries and other items of common interest could be arranged through annual or biennial meetings of directors and managers, as the international center directors have done.

Developing countries and development agencies are making major investments in irrigation to increase food production. The expected investment from 1980 to 2000 is about $100 billion (1980 dollars). Much of the total will be in new irrigation systems, but the higher priority (and investment return) is for the $20 billion investment to increase the efficiency of the final watercourses and the on-farm use of water in existing and new irrigation systems. Significant improvement of the watercourses and the on-farm use will deliver more water to the plants when they need it - the purpose of irrigation. More acres can be planted and higher yields obtained, thus increasing the return on the investment in the whole irrigation system. Water-logging and salinity can be prevented, thereby avoiding losses associated with poor water management.

While AID generally knows what we want to accomplish, we do not know how we can best accomplish it. CGIAR donors and TAC have examined the needs and opportunities for an international effort to improve on-farm water management, but there is not yet a consensus in CGIAR on what needs to be done, TAC recommended a research and training center be established, but CGIAR was not willing to proceed without further analysis. CGIAR apparently wanted a more thorough analysis of the problems within context and the comparative advantages of alternative solution models. TAC has not been responsive to CGIAR's request for further analysis and we do not expect TAC to produce an analysis and strategy that will engender positive action by CGIAR in 1981.

While the function of an international effort on water management has not been set, we see the priority development opportunities centering on our ability to improve the efficiency of final delivery and on-farm use of irrigation water. We need to be able to do two things. First, we need to be able to continuously increase the water management efficiency in existing irrigation systems. Secondly, we need to be able to organize the management of water in new irrigation systems so that its use efficiency will be as high as possible. Moreover, in each of these situations, we cannot be satisfied with a one-time input of technology to increase water management efficiency by an increment. Instead, we see increasing water management efficiency as a continuous process, just as improving a crop or an animal or the management of soil is a continuous process. Each nation having extensive irrigation lands thus needs to be able to monitor what is going on in a given irrigation system; to identify potential improvements in that system; try such improvements on an experimental basis; select those that prove usable; see to their adoption on a widespread scale; and continue monitoring the water management system and continue to identify the next increment of improvement. The products of an international effort in this area must be useful in many locations. One-time pieces of technology will be less useful than the development of national capabilities to continue to improve water management.

On an international level, we can do several things to help developing countries get the needed flow of improved water management technology. We can call attention to the improvements that can be made in this area and show how a flow of such improvements can be developed. This is no small service, and if an international effort did nothing more, it would still be worthwhile. We can develop efficient methods for monitoring an irrigation system to learn

where the water management inefficiencies are occurring. We can train people to do that monitoring and to adapt monitoring principles to their own situation. We can try assumed physical, biological and social improvements in water management and decide whether they are likely usable and cost effective in a given site. We can train people to do that same kind of research in their own situation. We can facilitate communication on methods being used to monitor, research and improve water management and their results. Needed technology on irrigation methods and timing for a given crop or for a given soil will be developed in national stations and international crop centers and should not form a significant part of an international water management effort.

We have not established a firm position on the form of an international effort, but we are not convinced that a major research center with the usual investment in physical plant is the best, or even a usable, model. We see need for the work (mostly learning-by-doing) to take place in the living laboratories of actual command area development projects. Modest analytical laboratory facilities would be needed. We think the effort might best be held to a staff of 10-15 people during the first 5-6 years. A $3 million per year budget would then cover operating costs. Initial capital might run $3 or $4 million. Bilateral donor project and host country funds would likely form major inputs. The concepts should be tried in one location. If successful, additional locations could be developed where the water management problems were significantly different. The costs of additional locations would not be much less than costs of the first location.

India seems anxious to move ahead in this area. A.I.D., Ford Foundation and the Government appear to favor an international effort but may be too impatient to wait for CGIAR action. A.I.D., because of its work in Pakistan, is the technical leader in on-farm water management among donors. The World Bank is the major funder and is making large investments in India. A major effort is almost certain to develop in India during 1982. If compatible with India's needs, A.I.D. could encourage the development of a national effort in India in ways that would facilitate its transformation to an international program. If the CGIAR does not develop an international effort in 1982, a small group of donors could act apart from the CGIAR. In any case, A.I.D. (DS/AGR) needs to have about $0.5 million to help start an international program in on-farm water management during 1982 and about $1.0 million in 1983. USAID/Delhi will likely help fund the India-specific portions of the program, perhaps up to $2 million per year.

A series of bilateral projects could partially substitute for the international effort, but would require much greater total inputs if AID were involved. Many of the benefits of an international effort would be foregone with a series of bilateral efforts, but the U.S. would be more visible.

PLANT NUTRITION RESEARCH

TAC and CGIAR have considered plant nutrition research important within the total context of agricultural development and the formation of the International Fertilizer Development Center in the U.S. resulted in part from that priority in the CGIAR. At the time IFDC was formed there was some discussion with CGIAR of forming a broader effort in the area of plant nutrition. While IFDC began its work on fertilizer technology the companion work on other aspects of plant nutrition did not develop. At the May 1979 meeting of CGIAR in Paris, it became evident that the U.S. proposal that IFDC be accepted as a full member institution in CGIAR was going to be turned down. In part in response to that situation but also in response to the continued recognition that plant nutrition research was important for development, the CGIAR asked TAC to do an analysis of the global research work in the area of plant nutrition and recommend what actions, if any, the CGIAR should take in this area. Several persons thought that the TAC was being asked to do this analysis simply to avoid having to turn down the U.S. request for IFDC admission into the CGIAR. While there was some element of truth in that many also consider that an analysis of plant nutrient research, regardless of IFDC, was of sufficient priority to warrant the work.

At a later meeting TAC developed an outline of a paper on plant nutrition and agreed that they would ask two scientists at North Carolina State University to undertake the analysis. These two people had been involved in a similar analysis for AID leading to a proposed CRSP on soil management, and they were expected to have much of the needed base data.. The draft paper prepared by these two scientists has been presented to TAC and we have a copy. The authors relied heavily upon the analysis they had done on soil management and their suggestions in this paper on plant nutrition work seems to give too little emphasis to the plants and their relationships to the nutrients. I understand it is being revised to correct this deficiency. The authors use an agro-ecological zone approach to the subject of plant nutrition, as they did in the subject of soil management. Their zones include the humid tropics, semi-arid tropics, acid savannas, wetlands and steep lands. The authors describe research needs in terms of those related to resource appraisal, alleviation of stress factors, alleviating nutritional constraints, using biological resources, alleviating physical constraints, improving farming systems, and technology transfer. They suggest three alternatives for doing the needed research. One alternative is to strengthen existing organizations for this research, both national and international centers. A second alternative is the development of a center with a small technical staff that would act as a catalyst to foster the needed research in existing organizations. The third alternative is the development of a full-fledged international institute that would do research and training in plant nutrition. TAC has asked the authors to flesh out some of the ideas expressed in the paper on alternatives but to not make recommendations.

In mid 1979 70 soils scientists met at IRRI to discuss "soils constraints to food production". A major recommendation of that conference was that a steering committee develop a proposal for the establishment of a board to promote coordinated research to alleviate soil constraints to food production

in the tropics. Such a board has now been proposed under the name "International Board for Soil Resesource Management (IBSRM)". The recommended structure involves a board with a small permanent secretariat. The Secretariat would maintain soil management and soil characterization functions, offices for training and information services. The proposal for the formation of such a board identifies 4 ecological regions and the major soil limitations that restrict plant growth in each. The proposed board would provide support for networks or cells of research workers working on the alleviation of specific soil constraints for the development of soil management methods for different ecological regions. It would coordinate research on soil constraints by various national and international bodies, particularly the international agricultural research centers. The board would facilitate the translation of soil management and other research findings to other soil conditions by linking the research of the national programs with that of the centers. This approach seems very similar to the Benchmark Soils Project financed by DS/AGR for several years.

In spite of the association of plant nutrition research with the U.S. attempt to have IFDC sponsored by the CGIAR, it is likely that CGIAR will consider research on plant nutrients as fairly high priority for CGIAR action in the future. At this time one cannot prognose accurately the form or the subject of such an effort but it is reasonable to assume that the large international center mode would not be selected.

Much of the thinking on plant nutrition to date seems to have been done by persons whose first consideration is the soil and the soil solution from which plant nutrients are derived and little thought has been devoted to the problem by plant physiologists. It is reasonable to assume that this deficit will not go unnoticed in TAC and the donors and that whatever proposal eventually emerges in the area of plant nutrition will give plants, water and the soil a balanced view. It is probable that any effort by the CGIAR would be in terms of a secretariat and small technical coordinating unit that would require relatively few funds.

AID CGIAR Study

IV. Conclusions and Policy Proposals

A. Program plan and budget for the CGIAR over the next five years (1982-86).

The existing consensus approach to CGIAR five year budgeting is a nominal 20% growth rate, which was expected to provide up to 3% real growth for mature centers, to bring younger centers up to their planned levels of development and then limit them to a 3% maximum, and to allow for the addition of one new program per year. On the assumption of about 9% inflation on the average, the real growth would be on the order of 10% per year.

In 1981, the first year of the consensus approach, contributions have increased about 15%, and inflation seems to be running at 15%, so that there was no real growth achieved in the system overall, and some decline in some centers because of the need to provide for capital expenditures.

Based on this experience, a more realistic approach to five year planning should first of all separate increases in the cost of doing business from program content and deal with each separately. Secondly, it should be based on specific planning for each center, not on broad rules of thumb. Thirdly, it should allow enough flexibility to adjust to new program judgments and opportunities, and to changed economic and other circumstances. Fourthly, it should distinguish the capital costs of program expansion from continuing costs such as operating expenses, repair and replacement of plant and equipment, and increases in working capital made necessary by inflation.

This discussion deals first with program substance, then with priorities and lastly with inflation.

Since it is the first AID attempt to design center by center plans, it is subject to refinement in the light of further information and argument. Proposed AID contributions for FY 1982 will be determined through the normal approval process and for FY 1983 during the forthcoming AID budget review.

1. Centers to be kept level: Based on the specific discussions in the earlier part of this paper, it appears that IRRI, CIMMYT, CIP, IBGPR, IFPRI, CIAT and IITA should be held close to 1981 approved budget levels for the coming five years.

Such an approach assumes that problems identified in the analysis above can be handled without increased real program levels. The conclusions of TAC five yearly evaluations, or other evidence, may lead to revision of these projections. For example, it might be concluded that the CIMMYT method of using regional staff charged to its core budget to cooperate with national research systems is more efficient that the IRRI method of providing technical assistance teams financed through projects outside of the CGIAR budget. In that case, a real increase in the CIMMYT, and perhaps the IRRI programs as well, might be justified. Keeping the budgets level for planning purposes would not imply a static program. But each TAC evaluation team should be instructed to identify about 10% of the program of each center which it considers to be of lower priority than the rest, in case reductions need to be made, and in proposing any increases in expenditures, to identify compensating reductions that can be considered. Perhaps more important, the review of biennial budgets submitted by each center should focus on identification of low priority items which could be the basis for reductions if required, or could provide scope within any budget level for new activities at the same or another center.

2. Centers to be brought up to planned size and then held level:

ISNAR will reach its planned level of 20-25 professionals in 1982. Further budget expansion is expected to be in the form of projects financed by donors outside the CGIAR framework. Since all agree that building the capacity of national research systems is a relatively neglected and critical part of the system for increasing food production in developing countries, the sensible course is to support ISNAR at the planned level for a period of years until its effectiveness can be evaluated.

ILRAD should level off at the planned operations budget of $11 million in 1981, but the planned additional housing should be built when funds are available.

3. Center requiring expansion not yet approved by the CGIAR: ICRISAT. The expansion would provide for establishment of a sub-center activity in Africa, as called for in the recent TAC five year review and now proposed by the Board. As this plan is considered thought should also be given to ways of saving costs in India, which has a very accomplished national research system, to which some work might be transferred. ICRISAT would stabilize at about 80 senior staff and $16 million in operations.

4. Centers requiring special treatment:

WARDA: Thought should be given to transfer of WARDA out of the CGIAR system through creation of a special donor group for WARDA. The U.S. would be an active member of this group, with funds managed by the Africa Bureau. Requires the creation of an evaluation and audit structure for the WARDA program through the new donor group. This would be treating WARDA in a similar way to our approach to regional and sub-regional research and extension agencies in general. The WARDA-derived model could be used for other regional units, such as CATIE.

ILCA: Should be placed in a holding pattern pending establishment and CGIAR acceptance of a clear, achievable mandate and a new strategic plan. No further capital expenditure, minimal operating expense budget. The forthcoming TAC review is a critical turning point. Funds can be conditionally programmed in future years to bring ILCA up to the originally intended scale (recognizing that this may need change) both in capital and operating expense categories.

ICARDA: program should be held at current levels pending resolution of the security situation and the interest of OPEC nations. This will permit continuation of good quality but limited research. No further capital expenditure should be made in Syria or Lebanon. At a point when security seems to permit, or after two years whichever is less, a new implementing agency should be chosen by the CGIAR to work with the existing Board on replanning the center to take account of change in circumstances. On the assumption that OPEC countries will later come in as substantial donors, the CGIAR planning budget should contain conditionally programmed funds for the full capital and operating budget originally planned.

5. Additional priorities for the CGIAR:

Given the general mood of the donors and TAC, the CGIAR is not likely to start another major center involving a large physical plant and scientific staff during the next five years. Each item of high priority will be considered or fit into current centers. For example, if work on plantains is needed, the IITA program will be examined to see how well plantains would fit in. If a high priority area does not fit well into the present centers, alternative models will be examined. This is happening in the case of on-farm water management, and will likely happen in the case of plant nutrition.

The water management program most likely to develop would include a training and quite modest field research effort in India. The learning and teaching would take place within canal command area development schemes funded by India, the World Bank or AID. The operating costs of the international program would be about $3 million a year. Capital costs for simple labs, equipment and training facilities would cost about $4 million. The international staff would be 15-20.

The plant nutrition program is likely to be based on expansion of work at the existing centers or a network of soil scientists and plant physiologists with a small coordinating unit. A large classical "center" is unlikely.

6. Budgetting for inflation

Looking back over several years of experience, an average rate of increase of costs of 9% does not seem unreasonable as a basis for long term projections. There is certainly no reason to insist upon 1980 experience as representing a new norm. On the other hand, the financial planning needs to take into account the possibility of variations both up and down, the reality of different experience in different centers, and the need to make management decisions to reduce costs as much as possible. It is therefore desirable that the CGIAR Secretariat become more active in assessing the performance of centers in dealing with rising costs, making as good projections as possible of inflation rates taking account of the markets in which each center purchases and the variation of exchange rates. Excessive cost increases in any one place may call for a new management approach to dealing with a specific research need.

The recent history of IITA is a case in point. Government policies have greatly increased the cost of IITA's program in Nigeria. IITA also needs to move technology components to their client nations. IITA is considering some shift in emphasis in its program from on-campus work to client nation locations both to test technology components and upgrade local research and extension capabilities.

As for the long term budget, the best approach would be to use an average based on several past years applied on a center by center basis to project the cash implications of the program plan. For the short range, the Secretariat should inform donors in time for their budget process (just over a year and a half ahead of the beginning of the calendar year in AID's case) of the cost of the agreed program plan plus expected inflation for that year, as best they can judge it. The assumption would be that both donors and the system would then plan on this basis and that adjustments would have to be made within the total if necessary. That would mean that higher than expected inflation would be reflected in temporary program reductions or postponements. Lower than expected inflation would lead to savings by donors if the change occurred before the grant was made to an individual center. If windfall savings are realized by a center after a grant is made, there should be arrangements to use them to reduce future needs, and not to permit unplanned program expansion.

7. Alternative CGIAR budgets:

There would be a range of possible approaches to the CGIAR budget in purely nominal terms: for example continue growth at 20 percent a year which is the consensus of 1979; or keep the budget fixed in dollars allowing inflation to eat into the program. Neither of these nor any other approach based purely on money figures seems to make sense. It would be better to agree on a broad program strategy and then attempt to meet the costs

of that strategy from year to year unless inflation becomes such an overwhelming problem that the strategy needs to be reconsidered. The choices seem to be:

a. To plan a reduction in the real level of total CGIAR expenditures.

b. to hold the real level steady, balancing reductions against increases.

c. to be willing to consider specific program increases up to a given percentage per year.

In connection with alternatives b and c, it would be necessary to add amounts for capital expenditures in some years depending on the initiatives chosen.

The following paragraphs try to establish priorities for reductions from the present level and priorities for increases, leading to a choice of overall program strategy.

To translate our proposals into specific numbers, we have worked on the basis of approved 1981 budgets, which will be somewhat above the actual funding level for 1981. Forward projections are in 1981 dollars, assuming that the policies recommended could be implemented in 1982. The results are then computed in current dollars on a rough projection of inflation rates.

8. <u>Priorities for reductions (in order):</u>

a. Eliminate at once any areas of activity within existing centers which are judged to be of lower than acceptable effectiveness, and use the forthcoming set of five yearly evaluations under TAC to identify low priority areas within existing programs which can be cut back. At a moderate level of severity this should probably be done in any case.

b. Eliminate WARDA on the grounds that it does not fit the CGIAR policy, would not be admitted if suggested now, and is best sponsored and monitored by a group of donors who consider research and extension aspects and overall organizational performance together in the light of West African needs. WARDA would continue to receive U.S. support; it would be linked to the CGIAR through relationships with IITA and IRRI.

c. Hold ICARDA substantially below planned levels. The present research in Syria should be continued at its current level, with no additional capital expenditure. There should be no further capital costs incurred in Lebanon or other countries. The research should be restricted as at present, to serving dryland agriculture. No further consideration should be given to development of sites in Iran, Turkey or other locations. The OPEC nations should be asked if they are sufficiently interested in ICARDA to fund construction of the physical plant ($30 million). If they will do that, and agree to put up half the operations budget we will agree to allow ICARDA to devote up to half its core research program to service to irrigated agriculture. If the OPEC nations are not interested we should maintain ICARDA as a dryland research unit if it can function from a security standpoint and at reasonable cost.

d. We should attempt to resolve the mandate and program issues of ILCA during the 1981 review. If they are resolved to reflect a move away from systems analysis, reliance on "shelf technology", and "monitoring" to opportunity identification, development and introduction of technological change with measurement of attributable effects, the U.S. should support the development of ILCA to a senior staff level of about 60-70 (assuming they can function as an international center in Ethiopia). If not, the U.S. should judge whether the current program is worth supporting, assuming gradual shifts

in program emphasis as characterized above. If the present program seems certain to continue, we should withdraw our support after 1983, but tell ILCA our intentions during 1982.

e. If a decision were made to reduce program levels by a substantial amount, the same exercise as in a. above could be conducted with a higher target of reductions in mind.

9. Priorities for increases (in order):

a. ICRISAT/ISNAR: Given the critical nature of enhancing national systems, and of increasing grain production in the semi-arid parts of Africa, highest priority should be given to bringing ISNAR and ICRISAT up to planned levels within any alternative.

b. Water management: ranked high because of the leverage which improved water use technology has on enormous investments being made and planned. This would be a program rising to $3 million per year plus about $4 million in capital expenditure. Issue: could this be handled equally well outside of the CGIAR?

c. ILCA: sufficient operating and capital funds to mount a well considered approach to livestock in African farming systems.

d. An unspecified initiative to begin in 1985, perhaps in plant nutrition, on the same scale as water management.

e. Allow small increases in the programs of successful existing centers, particularly those that would link with basic research conducted elsewhere, and those that would form more effective working relationships with national systems.

f. Replan ICARDA at a level adequate to meet the needs of the dry areas and the plateau areas.

CENTER BUDGETS ($ millions)

Center	1979 act.		1980 est.			1981 est.		Future budgets (1981 $), U.S. Plan 1982	1983	1984	1985	1986
	Total	(cap)	Total	(cap)	Avail.	Total	(cap)		(cap)	(cap)	(cap)	(cap)
A. Stable												
1. CIAT	14.3	(1.7)*	15.0	(0.6)	14.4	17.4	(0.6)	18.0	(Some shifts may occur among centers.)			
2. CIMMYT	14.8		17.0	(0.3)	16.3	20.4	(0.5)	21.0				
3. CIP	7.2	(0.6)	8.0	(0.4)	7.2	9.4	(0.9)	9.0				
4. IITA	16.9	(3.5)	15.1	(0.8)	14.5	17.1	(1.2)	18.0				
5. IRRI	14.2	(0.6)	15.9	(0.4)	15.7	19.4	(0.5)	20.5				
6. IBPGR	2.4		3.1		2.9	3.4		3.5				
7. IFPRI	1.9		2.4		2.4	3.0		3.0				
										Subtotal $93 million. *		
B. Planned Growth												
8. ISNAR	-		1.2		1.1	2.3		3.5	3.5	4	4	4
9. ILRAD	7.4	(1.8)	10.4	(1.6)	10.0	11.5	(1.6)	11.5 (0.5)	11.0	11	11	11
10. ICRISAT	12.2	(3.5)	12.4	(2.2)	10.4	13.9	(1.7)	15.5 (1.5)	17.5 (1.5)	16	16	16
C. Special Treatment												
11. WARDA	1.8	(0.3)	2.8	(0.2)	2.6	2.9	(0.2)	3.0	3.0	0	0	0
12. ILCA	9.0	(1.5)	9.0	(1.1)	8.9	10.1	(1.5)	9.0	9.0	9	9	9
13. ICARDA	10.1	(3.6)	11.8	(3.1)	11.5	14.9	(3.0)	12.0	12.0	12	12	12
Subtotal ($1981)								147.5	149	145	145	145
($Current)								170.0	193	204	222	242
D. Provisional Additional												
14. Water								1.0	5.0 (4)	2	3	3
15. ILCA								-	2.0	3	3	3
16. Unspecified								-	-	-	1	5(4)
17. ICARDA								-	-	7(7)	7(5)	7(5)
Totals ($1981)								148.5(2.0)	156(5.5)	157(7)	159(5)	163(9)
($Current)	112.2	(17.1)	124.2	(10.7)	117.8	145.6	(12.0)	171	201	220	243	272

* For 1979, '80, '81 figures in parentheses are capital component of total budget. Amounts up to about five percent of the total budget are usually for increases in working capital, routine replacement and repair. From 1982 onward these are included as part of ordinary operating costs and only significant capital costs are shown.

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1982 Planned Budgets.
CGIAR Secretariat and A.I.D. compared.

Center	CGIAR Plan Total	(cap)	AID Plan Total	(cap)
A. Stable				
1. CIAT	20.5	(0.5)	20.7	
2. CIMMYT	24.4	(0.5)	24.2	
3. CIP	11.0	(0.4)	10.4	
4. IITA	21.0	(0.8)	20.7	
5. IRRI	23.2	(0.8)	23.6	
6. IBPGR	4.0		4.0	
7. IFPRI	3.5		3.5	
B. Planned Growth				
8. ISNAR	4.2		4.0	
9. ILRAD	12.7	(1.2)	13.2	(0.6)
10. ICRISAT	18.3	(2.4)	17.8	(1.7)
C. Special Treatment				
11. WARDA	3.4	(0.1)	3.5	
12. ILCA	12.7	(1.8)	10.4	
13. ICARDA	18.5	(2.5)	13.8	
Totals	177.2	(10.8)	169.8	(2.3) **

* AID figures include increases in working capital, routine equipment replacement and repair and upkeep of buildings as part of ordinary operations. Only significant capital costs are identified (at ILRAD and ICRISAT).

** Significant variations are at ILCA and ICARDA where AID suggests no significant additional capital investment or increase in operations over 1981.

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10. Proposed position:

Adopt reductions (a) general comb out of less effective programs; (b) move WARDA off CGIAR funding; and (c) phase ICARDA down and replan at a more modest level.

Adopt increases (a) ICRISAT, ILRAD and ISNAR to planned levels; (b) initiative in water management; (c) replan ILCA on an adequate basis; and (d) allow for one additional initiative in 1985, and (e) balancing increases in programs of existing centers.

The overall financial implications of this position cannot be accurately predicted in part because of a number of individual judgments about programs need to be made, and in part because of uncertainties about the rate of inflation. In terms of 1981 dollars the total figure might be $156 million for the CGIAR in 1983 rising to $163 million in 1986, and including provision for capital expenditures in the following amounts:

1983	$ 5.5 million
1984	$ 7.0 million
1985	$ 5.0 million
1986	$ 9.0 million

Inflation should be projected on a center-by-center basis. But for a broad estimate, if it is assumed that there is a 15 percent rise in costs between 1981 and 1982, 12 percent in the following year and 9 percent each year thereafter, the total requirements under this formula in millions would be $201 in 1983 and $272 in 1986, compared to projections of $223 and $342 under the present formula.

B. The interaction of the centers with national systems in developing countries.

One way of stating the mission of the centers is the production of technology to be received by national research systems in developing countries, and adapted and applied to their food production problems. Thus, the relationship with national systems is critical to the effectiveness of the CGIAR structure. A small but growing number of developing countries have national research systems that require from international centers only genetic material they can incorporate in their own breeding programs, collaboration on complex or novel research problems, information on genotype performance and experience in other countries or relevant work in other laboratories, and an opportunity for professional interchange. Many developing countries, on the other hand, have only rudimentary research systems of their own and need technology that is almost ready for direct dissemination to farmers. The centers have to meet the varied needs of their national clients, and adjust to changes in those needs over time.

National systems also play a critical role in center research because they provide the indispensible network of research and experimental sites in different ecological conditions.

The issues that have troubled the CGIAR and the centers for many years are how far the centers should be expected to go in helping to strengthen national systems, how deeply they should become involved in national campaigns to raise production using center generated technology, and the best means for cooperating with and helping to strengthen national systems.

It is clear that the centers do not necessarily have a comparative advantage in helping developing countries plan and develop overall national agricultural research systems. Since there is continued demand for assistance

in this area beyond what was being provided by bilateral and multilateral assistance agencies, the CGIAR created the International Service for National Agricultural Research (ISNAR) devoted exclusively to this function, but with the expectation that most of its project costs would be met outside of the CGIAR.

On the question of how centers should think about their own role, the first CGIAR review concluded:

> ...cooperation with national programs is a vital component to the research activities of all centers. As a general rule the primary purpose of such cooperation should be research to advance the central mission of the center. However, centers should be alert and responsive to opportunities for additional cooperation with national programs, provided extra-core funds are available, the project is appropriate, it does not distort their central research thrust or place an undue burden on the center's administration personnel, and the review procedures [concerning long-range center planning] are met.

This remains a reasonable approach to the issue today. It has been interpreted flexibly by centers in accordance with their particular circumstances. For AID it is important to recognize that centers may not always be able to undertake technical assistance responsibilities we would like to thrust upon them. We should refrain from putting pressure on centers to accept project implementation roles which they feel are not appropriate for them or would strain their capacity.

Different models of cooperation with national systems persist among the centers, exemplified on the one hand by CIMMYT which maintains relatively large numbers of regional representatives to work actively with a number of

national systems; and on the other hand by IRRI which has a large number of contracts to provide technical assistance to individual national systems financed by donors outside the CGIAR framework. There is no agreement within the CGIAR on which of these approaches is more cost-effective, and it is not clear that any one center could easily change its structure. Clearly, the IRRI approach places less burden on the CGIAR budget proper, but the overall impact on aid donors and national systems is unclear.

C. The interaction of centers with research institutions in developed countries.

As the center by center analysis shows, it is usual for an individual center to have several active cooperative relationships with laboratories in advanced countries, some financed through the center budget and some not. Moreover some centers, CIMMYT in particular, produce scientific results which are of importance to the developed countries, so that the relationship is by no means a one way street.

The question of the center role in basic research is a subject of quite active discussion in the CGIAR review. There is a perception that the levels of production increase sought in developing countries over the long term can only be achieved through the discovery of new and fundamental knowledge in such areas as plant nutrition, photosynthesis, nitrogen fixation and stress tolerance. Some centers see themselves evolving over time toward institutions that do more basic research while applied studies are capably handled by national systems in developing countries.

It is misleading to talk in terms of basic and applied research. The centers are, and should remain, rigorously misson oriented. If solving a particular research problem is necessary in order to increase production of a crop within a center mandate, the center should not be deterred from

performing the research merely because it involves some elements of basic research. The choice of whether the particular work is done at a center, or contracted to another laboratory, should be resolved on the basis of cost and efficiency. Moreover, the centers need an active concern with quite fundamental studies in order to remain scientifically sharp.

On the other hand, centers should not be doing or financing broad spectrum research aimed at producing greater knowledge without direct relevance to production results. This is a job for institutions with scientific rather than production goals and for budgets other than development assistance.

It would be wasteful, however, not to draw from the centers the clues to requirements for basic research which arise from their experience of the needs of developing countries, and to make such clues available to the world scientific establishment in such a way as to influence the basic research agenda.

Conclusions under this heading:

1. We should oppose a major shift toward broad spectrum fundamental research by centers either now or in the future.

2. We should encourage the centers to pursue specific research problems, even though they involve seeking new fundamental knowledge, when these are critical to the mission of the center.

3. We should encourage the centers also to draw up statements of basic research needs for the consideration of the world scientific community. TAC should include this question in its five year review studies, and should take the initiative in bringing the results to the attention of scientists in

developed countries. AID should work with USDA and other science funding and research institutions in the United States to encourage basic research that may make a significant long-term contribution to food production in developing countries.

4. The proposal being developed by BIFAD to support interaction between U.S. research institutions and CGIAR centers should be given sympathetic consideration for AID funding as soon as budget permits.

D. The long-term role of centers:

When the first international agricultural research centers were started, it was expected that they would continue up to the point where national systems could take over and then go out of business. It is clear that none of the existing centers are approaching that point, although CIP has planned to move in that direction at the end of this decade. We are thus still some distance from the need for a decision on long term role. Still, it is helpful to have an appreciation of the long term possibilities in mind as medium term plans are made and decisions taken.

The discussion immediately preceding would rule out turning the centers into laboratories for broad spectrum basic research (though not prohibit using center facilities for this purpose under different sponsorship). A somewhat different model is already evolving in the relationship between the more mature centers such as IRRI and CIMMYT and the most competent national systems in developing countries, such as India, the Philippines, Brazil and Mexico. In relation to these countries the centers act as the hub of a problem solving network, locating quickly the expertise anywhere in the world that may be relevant to a new problem, and offering a channel for mobilizing that expertise, providing a forum for interchange of experience, identifying research priorities and suggesting an allocation of responsibilities on complex matters affecting several countries.

Clearly such a role is not appropriate for all centers. ILRAD, for example, might well just stop when it has developed immunization techniques for the two livestock diseases which are its present concern. But the network hub function is a logical evolution for many centers and is a role they must already begin to exercise to meet the needs of some clients even while others still require much more elementary forms of support. It is therefore a logical possibility that some centers could continue indefinitely in this network role. As that time approaches, this issue will need to be resolved center by center. Support for a network hub function would fall to the participants in the network, that is to those receiving its benefits. One can expect that the United States would have an interest in long term support for some centers, but not others.

E. The U.S. commitment to financing the activities of the CGIAR.

The CGIAR was formed when it became obvious that the concerted research approach used at CIMMYT and IRRI (the wheat and rice centers) should be expanded to other crops and areas and that the Rockefeller and Ford Foundations could not continue as sole supporters of the centers. Four meetings during 1969-70 led to the formation of CGIAR. The United States agreed to supply 25 percent of the required funds, but that statement assumed a quite modest demand. (The total in 1970 was $14 million.) In private conversation John Hannah told Floyd Williams in 1976 or 1977, that he (John) had made an agreement with "both sides of the aisle" in Congress that the U.S. committed itself to 25 percent funding of CGIAR when it was formed.

Each year since 1972 the U.S. has been prepared to contribute about 25 percent of the total available from all donors. The World Bank also bases its contribution on a formula (currently 10 percent), but apparently uses CGIAR-approved budgets as its base.

The importance of U.S. leadership in obtaining commitments for support for CGIAR activites from others was illustrated in 1979 when we provoked discussion of agricultural research at two economic summit meetings (Tokyo and Venice). With the personal intervention of the President we achieved a consensus on the planned increase of resources over a five-year period at the 20 percent pace.

For a number of years the World Bank assumed the position of "donor of last resort". The World Bank and the United States, and more recent other major donors, have coordinated their funding of individual centers so that each center receives approximately its CGIAR-approved budget. While the flexibility of donors varies, about half the total funding now responds in some degree to residual needs of centers. This has produced a fungibility of money factor that necessitates collective action to reduce or increase the budget of a center from the CGIAR-approved level.

The U.S. contribution to CGIAR is about 2.2 percent of the total U.S. public investment in agricultural research. It is about 6.5 percent of USDA's research budget. The AID contribution of $35 million to CGIAR in 1981 is about 5 percent of the AID Agriculture, Rural Development and Nutrition budget, 14 percent of the DSB budget, and 45 percent of the DS/AGR budget.

The issue to be addressed is whether the U.S. should maintain its support for the CGIAR system at about 25 percent of the total available funding. Alternatives would be to adopt a lower percentage, to fix our annual contribution based on some appreciation of the needs of the system as a whole without regard to the contributions of others, or to base U.S. funding for each center on our judgment of the priority of that center ignoring other donors.

The way our commitment works is that we pledge each November the amount included in our Congressional Presentation for the year or our latest estimate of a quarter of the total needs of the system, whichever is less, subject to 75 percent matching. In several years other pledges have brought our percentage below 25. In 1981, as in 1980, we may commit less than our pledge because of insufficient matching from others.

The table and chart show all donors, and reflect trends over the life of the CGIAR.

Suggestions that we should reduce our share are based on concern over the absolute amount ($42.5 million in FY 1982) and its relative size as a portion of the funds, particularly grant funds, available for AID food and agriculture activities.

Suggestions that we should make our own judgment of the priorities of the entire CGIAR program or of centers individually, are based on mistrust of the CGIAR system as a means for making priority judgments and managing effective implementation as compared with what we can do by more direct involvement.

A related point often made is that U.S. funds are contributed to CGIAR centers through a variety of channels, and that the actual U.S. proportion considerably exceeds 25 percent. The attached analysis prepared by PPC is relevant to this point (Tab A). It suggests that only the IFAD and UNDP contributions can be properly ascribed in part to U.S. funding. This would add $1.6 million to the U.S. total in 1980 of $29 million. However, these funds are not under U.S. control and if not contributed to the centers would be applied elsewhere. In relation to GNP our share is lower than that of 12 of the other 16 bilateral donors.

CGIAR CONTRIBUTIONS 1972-1980

($ millions)

	Actual								Estimated
	1972	1973	1974	1975	1976	1977	1978	1979	1980
African Dev. Bank							.025	.030	.040
Arab Fund						.310	.310		.255
Asian Dev. Bank				.300		.500	-	.700	-
Australia		.005	1.015	1.215	1.745	1.790	2.580	2.650	2.940
Belgium	.140	.600	.380	.620	1.740	2.250	2.720	3.080	3.460
Canada	1.160	1.780	4.675	4.340	5.390	6.800	7.370	6.750	6.900
Denmark	.250	.225	.370	.400	.455	.615	.760	1.045	1.180
EEC						2.500	2.240	3.790	4.550
Ford Foundation	5.315	3.675	3.000	2.800	2.000	1.590	1.000	1.000	1.000
France			.130	.410	.510	.415	.340	.685	.850
Germany		1.805	3.040	3.935	4.475	5.350	6.760	8.480	9.840
IDB			2.030	4.120	5.000	5.700	6.185	6.200	6.700
IDRC	.175	.345	.645	.990	1.780	1.305	1.045	.385	1.605
IFAD							-	1.660	4.050
Iran					1.975	2.000	1.000	-	-
Ireland							-	-	.200
Italy					.100	.030	.100	.100	.700
Japan	.105	.230	.265	.675	1.200	2.500	3.500	5.000	7.000
Kellogg Foundation	.155	.290	.280	.290	.300	.310	.320	-	.130
Leverhulme							-	-	.490
Mexico 1/							-	-	.500
Netherlands	.375	.430	.555	1.235	1.500	1.720	1.780	2.380	2.600
New Zealand					.105	.025	.025	.025	.025
Nigeria				.645	.645	.620	.790	.825	.840 2/
Norway	.075	.185	.445	.810	1.120	1.510	1.880	1.975	2.005
OPEC Fund							-	-	1.000
Philippines							-	-	.150
Rockefeller Foundation	3.990	4.545	3.500	2.885	2.165	1.595	1.250	1.220	1.600
Saudi Arabia					1.000	1.000	-	-	-
Sweden	1.000	.150	1.490	2.290	2.255	2.240	2.725	3.110	3.275
Switzerland		.410	.140	.460	.855	1.205	1.350	1.850	2.465
United Kingdom	.690	1.110	1.920	2.410	2.890	3.515	4.765	4.200	6.345
UNDP	.850	1.000	1.465	2.165	1.930	3.500	4.400	6.395	4.870
UNEP				.600	.340	.340	.240	-	-
United States	3.770	5.390	6.805	10.755	14.870	18.140	21.145	24.800	29.000
World Bank	1.260	2.780	2.375	3.195	6.525	7.850	8.675	10.200	12.000
Others									
Kresge	.750								
TOTAL	20.060	24.955	34.525	47.545	62.870	77.225	85.280	98.535	118.565

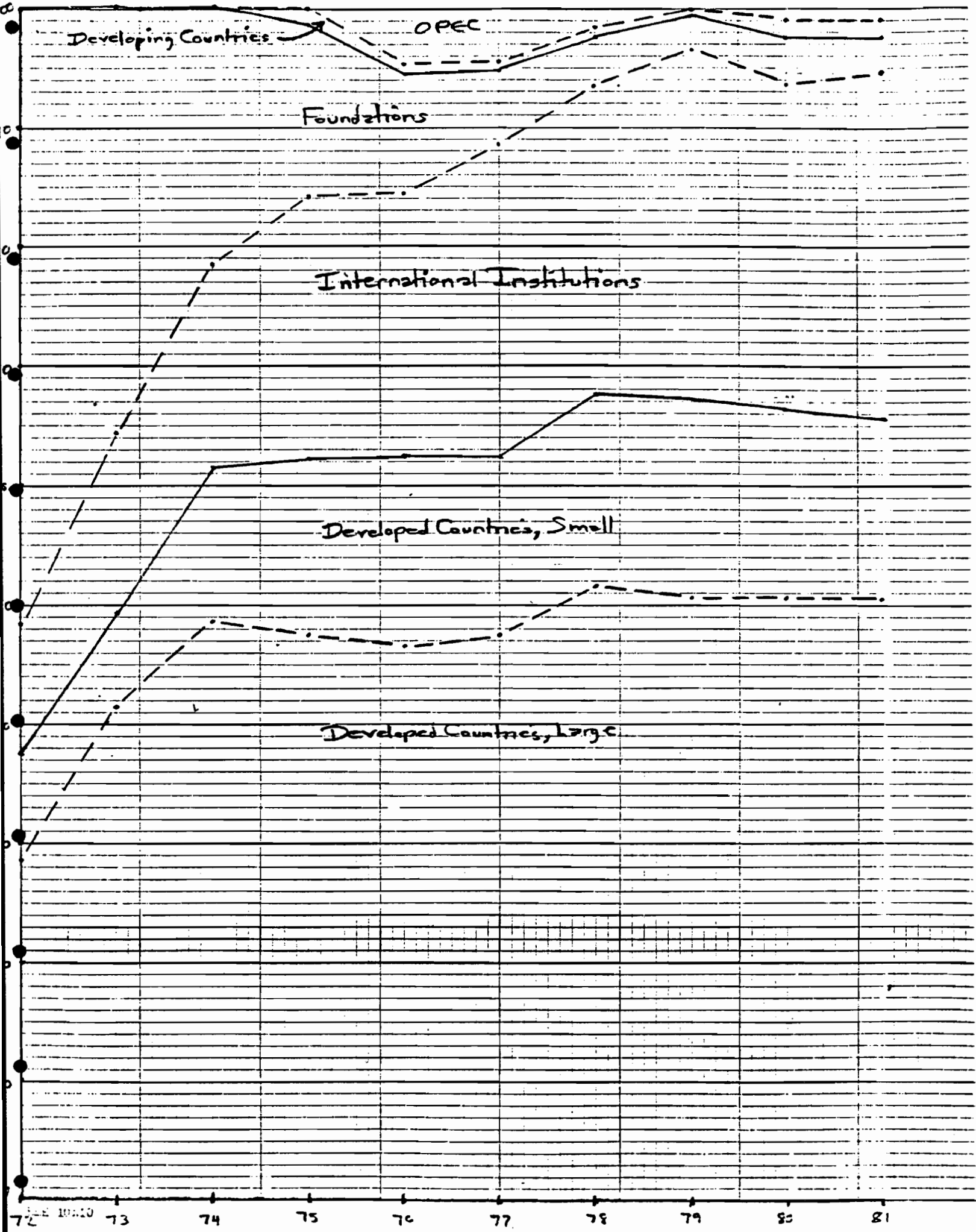
Source: Centers' Program and Budget Papers and accounts, 1974-1981.

1/ Contribution may be more.
2/ Part of 1978 and 1979 contribution was received in 1980.

October 8, 1980

Percent IV.20

PROPORTION OF CGIAR CONTRIBUTIONS BY TYPE OF DONOR



AID also contracts with centers for technical assistance services, but funds of this sort are not appropriately counted as support for the system or the centers as such.

There is no reason to think that a reduction in the U.S. percentage contribution to the CGIAR, particularly if implemented gradually and with notice, would necessarily disrupt unduly the overall work of the GC. It would lead to a reduction in the total funds available to the system, since there are no donors ready to take over a portion of our share. In fact, the likely result would be for others to fall back also, although the overall extent of loss of momentum cannot be estimated.

Such a reduction in the U.S. contribution would have to be based, in logic, on the assumption that taking four to one leverage into account better use could be found at the margin for the funds saved. This in turn relates to the issue discussed first in this section, namely the overall CGIAR program, and whether it can be adjusted to maintain a high level of performance. A reduction to, say, 20 percent achieved over three years would greatly increase financial pressure on the group and would somwhat reduce our influence on actions taken to deal with the pressure, although we would remain by far the largest donor.

Our CGIAR contributions in a fiscal year are spent by the centers in the calendar year which begins only three months later than our relevant fiscal year. Major changes late in our budget cycle would thus create the kind of program disruption for the centers that would seriously hamper their effectiveness. Reasonable certainty of fund availabilities several years in advance is also important for the management and planning system we have been helping the CGIAR establish, and will become more important if the kind of improvement we expect takes place as a result of the current CGIAR review.

Allocation of an absolute amount to the CGIAR as a whole each year without regard to other donors would involve a complex set of judgments which would be hard to defend. It would also tend to undermine the CGIAR's own decision and program management process and would weaken our own influence on that process, since we would have declared in advance our intention to ignore it. It might also lead to our making a more than 25 percent contribution to the system as a whole.

Finally, dealing with centers one by one would carry the undermining of the system a good deal further. It is possible that other donors would be able to make adjustments to offset the variations we introduced. If so, our changed approach would have little effect except to reduce total contributions. Otherwise, such an approach would lead to overfunding of some centers, underfunding of others, and relegation of the CGIAR to a simple money-raising function with reduced ability for meaningful technical evaluation or management control over the centers themselves. It would also take a good deal more intimate knowledge of individual center programs than we now possses, and have serious implications for increases in staff.

On balance, it seems best to maintain the 25 percent commitment, but to make it clearly conditional on our continuing to judge the system as meriting that level of support. This is a judgment we would need to renew regularly. Such an approach would give us maximum leverage over the decisions of the group, and an opportunity to work effectively for a program on the lines set forth at the beginning of this section.

F. Transfer of responsibility for the Genes Board (IBPGR)

While enormously useful to the centers and to developing countries, the IBPGR has a worldwide view of its responsibilities, meets the needs and protects the interests of all food growing countries and should continue

indefinitely. Consideration should therefore be given to transferring responsibility for U.S. funding to USDA beginning in 1983; alternatively, the costs of the IBPGR might appropriately be transferred to the regular budget of the FAO. This would not affect the U.S. share, but would place the requirement in our assessed FAO contribution.

G. International Agricultural Research Centers not under the CGIAR

This review has included materials on a variety of centers supported by the United States but not affiliated with the CGIAR. Some of them have been proposed at various times for CGIAR membership:

International Center for Insect Physiology and Ecology (ICIPE)

Asian Vegetable Research and Development Center (AVRDC)

International Fertilizer Developement Center (IFDC)

International Soybean Program (INTSOY)

International Center for Living Aquatic Resource Management (ICLARM)

Center for Tropical Agricultural Research and Training (CATIE)

(Material will be added at this point in the paper on any one of these centers where a policy or budget decision is required at this time.)

H. A.I.D. priority for national and international agricultural research.

If effective national agricultural research systems had been delivering the needed flow of usable improved technology to their farmer clients, there would have been no recognized need for the international agricultural research centers and the CGIAR would not have formed. The effectiveness of the centers in producing useful technology has both demonstrated the need for more effective national research systems and enhanced the priority of their development to developing countries and donors.

The centers and the CGIAR may prove useful adjuncts to effective national research systems, but the centers are not an acceptable longer term substitute for national research capabilities.

A flow of usable improved agricultural technology, usually the product of research, is an essential but not sufficient condition for sustained agricultural development. While every nation needs to adapt and use technology from any source, its ability to use imported technology and mold it to its own conditions will be roughly proportional to its ability to generate such technology in its indigenous institutions. The needed flow of technology thus requires capable institutions within the developing nations that are effectively linked to similar institutions in other nations.

As a part of A.I.D.'s agricultural development strategy we intend to help countries develop effective national agricultural research systems. Effective research institutions understand the conditions and problems of the farmers and provide a flow of improved technology that the farmer can use to increase productivity.

The following table shows science and technology activities in the food and nutrition account for FY 1980 and FY 1982 broken down by region. Field programs in agricultural research are growing, particularly in Africa, but seem to be growing less fast than the CGIAR contribution.

SCIENCE AND TECHNOLOGY
IN
A.I.D. FOOD AND NUTRITION PROGRAMS
(Dollars in thousands)

	Science and Technology		Research	
	FY 1980 Estimated	FY 1982 Proposed	FY 1980 Estimated	FY 1982 Proposed
Food and Nutrition				
Near East	8,312	5,407	2,912	2,857
Africa	50,932	57,095	24,431	27,582
Latin America	21,500	12,198	7,840	4,720
Asia	12,800	29,667	7,250	15,369
Regional Bureau Total	(93,544)	(104,367)	(42,433)	(50,528)
Central Bureaus	54,223	73,717	49,352	67,730
CGIAR	(29,600)	(42,500)	(29,600)	(42,500)
Total Food and Nutrition	147,767	178,084	91,785	118,258

NOTE: Research is a sub-category of Science and Technology. Comparative figures for the 1981 request are not available.

SOURCE: Amended FY 1982 Congressional Presentation

It would be a mistake to think of expenditures for international agricultural research centers and for national research systems as being narrowly competitive. Both are high priority activities within the overall Food and Nutrition account, and both could grow if necessary by drawing funds from other purposes within that account.

National research programs can also use loan funds in some cases, and there are opportunities for AID technical assistance to combine with capital aid from other sources such as the World Bank as well.

For purposes of this study it is sufficient to say that national agricultural research systems play a critical role in our programs to increase food production in developing countries. This judgment reinforces and does not detract from the priority that attaches to the international agricultural research system to which national systems are linked.

V. Organization and management of the CGIAR system

From its early days the CGIAR has been able to maintain a spirit of cooperation and sense of informality that has served it well, making it unusual among international organizations in its lack of bureaucracy and in the relative absence of international political hassle. The rather complex yet informal structure of the CGIAR begins with the three sponsors, the World Bank, the FAO and the UNDP. Representatives of the sponsors meet from time to time to set the agenda of meetings and select people to fill key positions in the group (membership of the Technical Advisory Committee, members of center broads selected by the CGIAR, etc.).

The CGIAR itself is composed of donors each of which intends to make substantial grants each year to centers sponsored by the system, plus representatives of developing countries selected through the regional conferences of the FAO. The group meets once or sometimes twice per year under the chairmanship of a Vice President of the World Bank. Votes are very rare, and the group operates largely on the basis of consensus.

A small Secretariat headed by an Executive Secretary works in the World Bank under the direction of the CGIAR Chairman. The Secretariat operates as the eyes and ears of the group. Besides normal ministerial functions, its main role is fund raising to meet budget requirements. In addition it prepares an annual overall statement relating substantive and financial matters, and is the main vehicle for providing budget guidance to centers and for adjusting budgets to match available funds.

The CGIAR also has a Technical Advisory Committee (TAC) composed of twelve part-time members plus a chairman who spends half time on CGIAR business. The TAC is composed of persons with scientific qualifications chosen in part to ensure representation of both donor countries and developing countries. A small TAC secretariat is provided by the FAO and works out of Rome.

One TAC function has been to review plans for new activities and recommend action to the group. TAC also prepares a periodic analysis of research priorities, and organizes an overall evaluation of each center's work at five year intervals. TAC reviews each center's budget and program proposals annually and makes recommendations for reductions and other changes which become the basis for CG Secretariat action.

The unique characteristic of the CGIAR, however, is the international agricultural research centers themselves. With some exceptions, each of them is a private entity organized within the laws of the host country, but given special international status and recognized as an international agency. The centers are each controlled by a board of trustees who are entirely responsible for program, budget and staff. There are usually ex-officio board members representing the government of the host country, and in most cases three members chosen by the CGIAR; otherwise the boards are self-perpetuating. The funding relationship runs from each donor directly to the center whose board is responsible to the donor for the proper use of funds.

1. Perceived problems:

a. The amount of money involved, now approaching $150 million per year, and the complexity of the system is felt to exceed what can be handled by a structure in which responsibility and decision-making are as diffuse and informal as they are within the CGIAR.

b. It is not likely that the group can continue to increase funding at anything like past rates, particularly in real terms. Moreover, some of the activities being supported are clearly less effective than others. This situation calls for an ability to allocate available funds, and to cut back and possibily eliminate some programs. The group does not seem to have an

effective means of taking such decisions within the present structure. (It should be noted that the group has been able to deal with significant management problems, as in ILRAD, and to withhold planned growth for a center which lacked program focus, ILCA. It has, however, let the WARDA situation continue and has waffled on the problems presented by ICARDA. There has been some adjustment of programs in response to priority recommendations of the TAC, but in the budget crunch of 1981, reductions were allocated largely on a percentage basis, and the system has reacted mainly by trimming in easy and temporary ways, such as reducing training programs.)

c. There has been no effective means of setting priorities for new activities and moving promptly to implementation of new programs. The TAC has studies subjects such as water management, plant nutrition, fisheries, vegetables and others for a number of years without concrete result.

d. Relations among the three co-sponsors have never been entirely easy. The FAO has wished to have a greater voice than it does, while at the same time providing the TAC with a relatively small and weak staff. There is a general feeling that TAC needs to be stronger, both in terms of having more time and technical capacity, and in facing complex issues which are part scientific and substantive program questions, and part political.

e. A few donors have resented the role played by the CGIAR Secretariat, but on the whole the feeling is that the Secretariat staff is not strong enough, and should be more broadly competent in management and scientific matters. Working relations between the TAC Secretariat and the CGIAR Secretariat need to be further strengthened, which is not easy given their geographic separation, and their separate organizational loyalties.

f. Some find anomaly in the independent role of the center boards, who owe no formal responsibility to the CGIAR which raises the funding on which the centers depend.

g. The boards of some centers are weak, and are dominated by the director. Some boards do not contain the specific skills, such as experience in management of research programs, which are critical to their performance. There is no systematic check on board performance, and no procedure available to the CGIAR or the donors to intervene to change board membership when a board is weak or ineffective.

h. Considerable anxiety is caused by the ineffectuality of developing country representation in the CGIAR meetings. Developing country representatives, chosen by FAO regional conferences, often do not even attend meetings and play very little role when they are present. Developing countries are represented on the TAC and on the boards of each of the centers, but the danger that centers may be unresponsive to their clients or become isolated from the communities they are intended to serve is thought to be signficant.

2. Proposed changes in structure:

Those with experience in the CGIAR over even a relatively short period are in complete agreement that the group must protect its non-bureaucratic nature and avoid becoming entangled in international politics. It remains to be seen, however, what practical proposals will appear to most members to be consistent with those principles, yet provide the minimum of increased management effectiveness necessary to deal with perceived problems. Among the changes being proposed are the following:

a. A somewhat extreme view, taken by the FAO representative who has long experience in the group and was an early member of the TAC, is that there should be a deliberate halt to expansion of program: the group should avoid growing further because the management problems will otherwise be insoluble.

This is somewhat akin to the idea current at the time of the first CGIAR review that individual centers should not grow beyond a certain size because they might lose the ability to innovate and to work effectively within an informal structure if they become too large.

b. Organizationally, there are proposals firmly held by some, that efficiency can be greatly increased if the TAC and the CGIAR secretariats can be brought together in a single staff at a single location. If the World Bank and the FAO cannot agree on a procedure for doing this--proponents of this move believe the whole operation should be at the Bank in Washington--the donors should consider setting up a combined CGIAR secretariat independent of any of the co-sponsors. This would add something to donor costs, since the co-sponsors now meet the administrative expenses of the two secretariats, but that would be a relatively small matter if the gain in management capability for the system were substantial.

c. There are proposals to strengthen the CG Secretariat by adding more scientific capacity, and greater ability to give financial and management oversight to the centers. Single annual audits of center performance in financial management are proposed to replace the variety of audit systems now in effect. Perhaps one auditing firm under the guidance of the CG secretariat would do the entire job, with the results available to all interested donors. The Secretariat might have capacity to provide management technical assistance to centers requesting it.

d. A related set of ideas concerns the budgetting system for the group. The report of the first review committee suggested a number of steps such as two year budgets for each center, preparation of long term plans, and other steps to improve financial and program planning. These have been only partly implemented. It is proposed now to carry these steps through

completely and add features such as requiring centers actually to follow the same guidelines in preparing budget documents, and providing advance budget guidance reflecting overall priority judgments agreed by the group. These steps imply both increased capacity at the CG secretariat and a more cooperative approach from some centers. They also carry the threat of bureaucracy.

e. Various ideas for strengthening the TAC are being considered, including enhancing TAC staff capacity, and having the TAC chairman serve full time. At the same time it is proposed to restrict the role of the TAC concentrating budget and system management responsibilities in the CG Secretariat.

f. Some proposals would have the authority of the center boards of directors sharply curtailed, requiring them to conform to policies established by the CGIAR itself. A more likely approach would be to have the CG Secretariat, with help from donors, systematically monitor the performance of boards and use various means of improving that performance when necessary. The CGIAR could use its right to nominate members -- at all but a few of the older centers -- to ensure that each board has strong management, scientific and other needed talent. Perhaps the members named by the CGIAR should be expected to represent CG attitudes in board deliberations and otherwise play a mediating role. Also being discussed are means for the group to intervene when affairs at a center get out of hand. (The recent experience with ILRAD and ILCA suggests that means may already exist, de facto.)

g. A central and difficult problem is how to take critical decisions on such matters as allocation of scarce funds, termination of a program, or approval of a change in priorities. The study team appears likely to recommend creation of a management committee within the CGIAR structure,

including donors, representatives of center boards, representatives of the sponsors and the TAC, and perhaps a limited number of expert outsiders. This committee would meet as often as necessary during the year to make decisions on matters put before it by the Secretariat, and subject to concurrence by the group as a whole at its next meeting. It would presumably have to operate within a consensus role, but could take considerable leadership and hopefully also restrain the Secretariat staff.

h. One proposal for enhancing the participation of LDC representatives in the CGIAR itself has been to let the new organizations of agricultural research directors for Asia, Africa and Latin America provide and instruct these representatives. One drawback is that the research directors may not reflect the economic development policies of their governments, which are also important inputs for the CGIAR. An alternative would be to have the countries that play host to centers become members of the CG.

3. U.S. philosophy in considering structural changes in the system:

It is obvious that changes of the type being discussed must reflect broad support among the donors and other agencies involved if they are going to work. It is better, therefore, for us to identify a range of acceptable outcomes rather than to try to specify a single program of organizational change and attempt to sell it to the group.

It is clear that the CGIAR has already grown too large to work precisely as it has in the past, so that some changes are needed whatever the prognosis for program growth in the coming five years.

The idea of taking the secretariat functions away from the FAO and the World Bank has a superficial attractiveness. But it would risk losing support in both those organizations, which remains important financially in the case of the World Bank, and in other ways for both. Given the broad

responsibilities of the FAO in world food matters and the tenacity of that agency's leadership, it could be divisive to attempt to cut the CGIAR entirely loose from FAO. The overall administrative and analytical capacity of the World Bank and its willingness to make the cause of the CGIAR its own on many occasions may well continue to be important in the future, as it has been in the past. Therefore we should oppose any effort to do away with the sponsor role of the World Bank or the FAO or both.

On the other hand, most of the proposals for strengthening the CG Secretariat and the TAC do make sense, as does the proposal for a small management committee. We will want to study carefully the proposed make up of the committee in terms primarily of its capacity to take effective action. While strengthening TAC we should probably also circumscribe its role, shifting the main responsibility for budget to the management committee with support from the CGIAR Secretariat, and technical advice from the TAC.

Any signficant reduction in the independence of centers and of their governing boards should be opposed as striking at the heart of what makes the center system work. On the other hand, means do need to be found to ensure continued high quality membership on boards, to monitor board performance, and to intervene when necessary to strengthen boards. As for participation of ldc representatives in the CGIAR meetings, we should not oppose any reasonable means of making such participation more effective, so long as there is not a tendency to bring the North/South dialogue onto the annual agenda of Centers Week.

VI. U.S. management of participation in the CGIAR:

In preparing this paper, we have found that while we know a good deal about some of the centers, we should know much more about many of them, not only to discharge the responsibilities connected with our support for centers and for the CGIAR system, but also to make useful connections between center work and other parts of the AID program, particularly mission activities. The size and importance of the enterprise seems clearly to justify some increased management attention.

Before coming to a judgment about how much staff time should be invested, and how it should be organized, it is first necessary to consider whether: we should work mainly to support the CGIAR's own machinery, making it work as well as possible and then basing our own program decisions on the product of that system; or we should treat centers as if they were independent projects and place most of our energy in management of our investment in each center. For the latter approach we would probably need a total of five work years of technical staff devoted to the CGIAR, while to do an adequate job of supporting the CGIAR structure would take at least three professional work years. The present level is estimated to be a work year and a half.

The choice to be made obviously relates to the approach we take to the CGIAR budget: if we decide to concentrate our funds on individual centers we judge to be of high priority, our principal management relationship will presumably be with those centers rather than with the group. On the other hand, if we continue to provide a specified percentage of the total CGIAR program, we have at least the option of concentrating our effort at the level of the whole group.

If we decide to work mainly through the CGIAR system, we would not conduct our own audits or evaluations of center activities, but would spend time instead on helping ensure that these studies as conducted by the CGIAR were directed to the most important issues, and in interpreting the results.

There would be a great deal to do both directly and indirectly to support the system, which can only work if there are well informed donors to serve on the management committee and bringing to that role extensive understanding of what is happening in the system and its various parts. In addition, the A.I.D. staff could take greater interest in the membership of the boards of trustees, canvas U.S. agricultural laboratories, universities and private firms for suitable members, and perhaps provide inducements for them to serve and to spend sufficient time on the work of the center.

We could engage in a continuous search for suitable candidates for various CGIAR posts, such as membership on the TAC, using the field missions as a source of candidates. Contacts with the representatives of other donors could be kept current, along with knowledge of center activities. We could perform our own analysis of CGIAR priority issues, using TAC data and analysis and adding to it.

More specific attention could be paid to the interface between U.S. research and technical assistance contractors and grantees and individual centers. The BIFAD and JRC could be provided with complete and up-to-date information about the work of the CGIAR and their advice fed back into the system. Time could be spent promoting increased attention by the U.S. scientific community to basic research issues arising from centers' work.

It seems likely that the Ford and Rockefeller Foundations will be pulling back from their engagement in the CGIAR, going on after twenty or more years to new endeavors. Much of what has been suggested above would replace a role

these Foundations have played, for example in providing members to the board of centers with enough time to devote substantial attention to center affairs. Another role played particularly by the Rockefeller Foundation has been to provide key scientific staff to the centers with long term job security, thus making it possible for outstanding U.S. scientists to commit themselves to center work for substantial periods. AID might well consider whether actions on this line, and in other ways picking up some of the foundation role, may be needed to strengthen the CGIAR system.

The principal argument for working with individual centers is lack of trust in the capacity of the system to do an adequate overall management job, and the need for the United States to ensure that its contributions are well and appropriately used, whatever happens to the CG and to other aspects of center activities.

If we can assume that the CGIAR will adopt effective measures to improve the functioning of the system, it seems clear that on the grounds of staff efficiency and greater development effectiveness, working through that system is the obvious choice.

1. Staff commitment: In order to carry our weight in the system, assuming a reduced role for the Ford and Rockefeller Foundations, AID should commit three years of professional time, with adequate secretarial and travel support, to the CGIAR. The officers involved need to be protected from other demands on their time, so that they can give first priority to CGIAR matters, even when these seem less pressing.

2. CGIAR representation: In contrast with some other donors, the United States has changed its representation in the CGIAR rather frequently, having no one presently active in a senior role whose experience goes back to the earliest years of the CGIAR. Other donors have managed to keep the same

individual as representative to the group for longer period, or have had individuals associated with their CGIAR delegations for long periods as senior advisors. They have been able to establish their people in roles of trust and leadership beyond those justified by the relative size of their contributions.

Given the prestige attached to the CGIAR and the U.S. system of replacing senior policy officials after each change in the Presidency, it will be difficult for the United States to keep the same person as its CGIAR representative for a great many years. Other means of continuity should be sought, including the posssibility of having a senior agriculturalist serve in Washington for a tour of five years or more with lead responsibility for the CGIAR, or associating one or more outside consultants with U.S. participation on a more or less permanent basis.

3. Role of BIFAD and JRC: A JRC subcommittee has made important contributions to the present study, and there will be an opportunity for the presentation of any separate views which the JRC or the BIFAD staff wish the Administrator to consider along with the action document based on the report. The question remains of what role the JRC should have on a continuing basis with respect to the CGIAR and other international agricultural research centers which are clearly intended to be considered a part of the Title XII program.

Whichever part of the BIFAD structure, the JRC or the JCAD, is held responsible for recommending initiatives in building national research systems in the developing countries, that organ clearly needs to be fully aware of the work of the international agricultural research centers. These centers must be linked to national systems in order to function effectively; national

systems can and should draw on the capacities of the centers. Moreover, there is always the possibility of using ISNAR services, whether or not financed by the United States, in assessing country needs and designing appropriate institutions.

More broadly, the work of the CGIAR and other international centers should find a place in the JRC consideration of overall priorities for agricultural research for AID support. The JRC needs to take into account what the CGIAR is doing and plans to do whenever the JRC is considering priorities for the AID research program, and should comment on CGIAR programs and priorities in that light.

To assist the JRC in carrying out its functions, the AID staff concerned with the CGIAR and with other centers should refer to the JRC for information and recommendations any evaluations of centers, analysis of program priorities, or other long term planning documents for the centers or the CGIAR as a whole. When the JRC makes recommendations they should be taken fully into account in determining the U.S. position.

The JRC should place international center issues on the agenda of the BIFAD whenever it seems appropriate. BIFAD does consider CGIAR budget provisions in the course of its annual review of the AID budget, and that would continue and hopefully be better informed as a result of the consideration suggested above.

A particular concern of the JRC will continue to be how the work of U.S. agricultural research institutions, and universities engaged in overseas technical assistance, can be tied into the efforts of the international centers, to the benefit of both.

(Note: The above paragraphs, drafted at the request of BIFAD staff, are subject to review on behalf of the JRC.)

4. Handling CGIAR funding in the AID budget: In practice, the required annual contribution to the CGIAR is generally known fairly well at the time of AID budget formulation, and tends to hold at or close to its original level through the entire budget process to actual implementation of the program. Central programs as a whole, however, tend to be cut at least proportionally from initial budget levels in response to reductions made in the OMB process or by the Congress. As a result, the food and nutrition activities of DSB, and more particularly the work of the Office of Agriculture, often take a disproportionate reduction because of the necessity to protect the CGIAR contribution. As the CG contribution has grown through the years while AID budgets have not, this effect has become more and more marked.

The solution would appear to be finding a means whereby the CGIAR contribution can compete against the whole food and nutrition account independently of other DSB food and nutrition programs which also should compete with the whole food and nutrition account. Another way of phrasing the desired result is that the CGIAR amount should be fixed as an AID decision, not a DSB decision.

The simplist way of achieving this would be for the CGIAR amount to be placed in the OYB and other budget documents as a separate element, and not merged with the DSB food and nutrition total. Treating the CGIAR figure as a separate item would ensure that other central food and nutrition activities would not be automatically downgraded in priority but could be judged on their own merits.

Another approach would be to have a separate appropriation line for the CGIAR, somewhat like the new program for Science and Technology Cooperation. This would have the drawback of requiring the Congress to make an explicit decision each year on the CGIAR contribution, thus reducinng flexibility

to adjust to such events as a shortfall in other donor contributions. It would also introduce an apparent reduction in AID's emphasis on food and nutrition. Improved internal management of the allocation of funds, as suggested above, seems the best alternative.

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

1818 H St., N.W. Washington, D.C. 20433 U.S.A.
Telephone (Area Code 202) 477-3592
Cable Address – INTBAFRAD

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ICW/80/11

FROM: The Secretariat

September 15, 1980

Consultative Group Meeting

October 30-31, 1980

Agenda Item 9

Attached, for the information of Group members and others attending the Consultative Group Meeting at Manila from October 30 through 31, is a copy of a paper outlining proposals for the second review of the CGIAR system.

This matter will be discussed under Agenda Item 9 at the meeting.

Attachment

Distribution:

CG Members
TAC Chairman
TAC Secretariat
Center Board Chairmen
Center Directors

ICW/80/11

September 15, 1980

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

THE SECOND REVIEW OF THE CGIAR SYSTEM

* * *

PROPOSAL

Background

1. The CGIAR undertook an overall review of its objectives, policies, and procedures in 1976. Since that time, there have been changes in the Group itself and in the environment in which it operates. Membership has expanded, and new activities have been taken on or created which are different in character from the original biologically-based institutes. The Group's resources and activities have grown to the point where it has high visibility in many aid organizations, and where questions of accountability and cost-effectiveness are inevitably becoming more insistent. The success, so far, of the CGIAR as a means of marshalling international support for research has been widely recognized, and consideration given to applying it to other fields. In the broader context, overseas development programs generally face strong domestic challenge amidst attempts to address the problem of improving economic relations between the North and South.

2. After almost ten years since it was founded and five since the last review, the CGIAR felt it appropriate that a second review should be undertaken, and at its meeting in November 1979 decided to commission it for completion during 1981. It asked the Secretariat to prepare a proposal for consideration at the CGIAR meeting in October 1980, and to take other preparatory steps. This paper contains such a proposal.

Purpose and Objectives

3. The purpose of the Review will be to recommend the strategy for the CGIAR system for the next decade in terms of objectives, the policies to be pursued, the range of activities to be supported, and the resources to be sought, and to make recommendations respecting the organization and procedures needed to implement the strategy effectively and assure the efficient functioning of the system.

Organization of the Review

4. The CGIAR will entrust the Review to a Review Committee of about 15 individuals, selected by the Chairman of the Group on the basis of their personal experience and qualifications in relevant fields. They would be drawn from the various constituencies within the system — contributing members, beneficiary countries, the international research institutions (including their Boards) and the Technical Advisory Committee. Representatives of the Group's Cosponsors, and the Chairman of TAC, could attend

Committee meetings ex officio. It is expected that the Committee will meet three times during 1981 for about two days each time, in mid-January, mid-May and mid-July. The Committee would submit a report to be considered at the meeting of the CGIAR in the last quarter of 1981. It has been suggested that the Chairman of the Group serve ex officio as Chairman of the Review Committee, and the Group should decide whether this is desirable.

The Committee will have as its staff a Study Team consisting of four or five consultants, headed by a Study Director, and assisted by a Secretary to the Team. The Study Team would work virtually full-time from January 1981 through May 1981, with some part-time activities before and after this period. Other consultants may be retained for shorter periods as needed to study specialized subjects. The Study Team will be provided with secretarial and other support services, and will work out of offices provided by the World Bank in Washington.

Good assessments of the outlook for future food production and consumption in the developing countries are available, so while the Committee will need to be fully acquainted with the basic problem to which the CGIAR is addressed, it will not need to undertake an independent assessment. Similarly, much good work has been done by TAC on some of the important issues facing the Committee, particularly the priority of various kinds of research. TAC's reports on these questions will be essential inputs to the work of the Committee and the Study Team, which consequently should not need to undertake further original work in these areas.

Ground to be Covered

It is proposed that in carrying out the review the Committee should address four main areas, (a) the Group's strategy for the future, (b) the appropriate relationship of the Group and the system to the beneficiary countries, (c) the structure, organization and governance of the system, and (d) efficiency in operations and use of resources.

The Committee should examine and reformulate for the next decade the Group's purpose, objectives and strategy, testing these for relevance, timeliness, feasibility and promise in the light of the present circumstances of the developing countries and the likely available resources. This should be done within a global context, taking into account other agricultural research efforts -- the developing countries' own efforts, research in the industrialized countries, and efforts of other international bodies and the private sector. It will necessarily entail considering what properly falls within the ambit of the CGIAR system and the scale of future operations.

The CGIAR system exists to further the development of agriculture in the developing countries. The Committee should, therefore, consider how well it serves their interests in today's circumstances and recommend whether changes should be made and steps taken to ensure that their needs, views and aspirations are understood and properly taken into account.

The structure and organization of the CGIAR system is already well established. The Committee should consider whether they continue to be well suited to implementing the strategy for the future. Is radical change needed? If not, could adjustments be made which would improve their effectiveness and ensure better coordination and rationalization of the functions of the principal elements -- the Group itself, the Cosponsors, the Centers and their Boards, TAC and its Secretariat and the Secretariat of the CGIAR. The Committee will wish to consider respective responsibility for policy formulation, planning, decision making, accountability, monitoring and control.

The manpower and funds at the disposal of the CGIAR are scarce resources. The Committee should consider and make recommendations on efficiency in operations and in the use of resources. This will entail consideration of how priorities for the system as a whole and its individual components are set and adhered to, of mechanisms for balancing the claims for funds and the available supply, and of the optimum size and productive life of an international research institution.

In carrying out the review and making recommendations the Review Committee will concern itself with the Group and the system as a whole and not with the operation of individual centers or programs. More detailed draft Terms of Reference for the Committee are attached as Annex I.

Financial Arrangements and Budget

The cost of the Review will be met from a Review Fund, contributed by CGIAR members and administered by the World Bank. Costs to be met from the Fund would include:

- travel and subsistence of Committee members whose organizations cannot cover them;
- Committee meeting expenses;
- fees, travel and subsistence of members of the Study Team;
- costs of support staff for the Study Team;
- data processing, communications, report production.

Total cost of the Review is provisionally estimated at about $465,000, made up as follows:

Preparatory Work (May - December 1980)	$ 64,000
Study Team, and support services	328,000
Committee	73,000
	$465,000.

A more detailed budget is attached as Annex II.

DRAFT TERMS OF REFERENCE FOR THE REVIEW COMMITTEE

1. The purpose of the Review to be conducted by the Review Committee is to examine the CGIAR and the system of research it supports, to recommend the strategy for the next decade and a plan for the years immediately ahead and to make recommendations respecting organization and procedures needed to implement the strategy effectively and assure efficient functioning. More specifically, the Committee will:

(a) Examine and, as necessary, reformulate for the Group's consideration its objectives, policies to be pursued, range of activities to be supported, and level of resources to be sought, testing these for relevance, timeliness, feasibility and promise in the light of the present and changing circumstances of the developing countries and the likely availability of resources. In this the Committee will consider:

(i) the place of the CGIAR system within the total agricultural research effort addressed to the developing countries comprising developing countries' national programs, regional programs, programs in the industrialized countries and in the private sector;

(ii) the choice between supporting agricultural research selectively as needed to fill gaps as against embracing a fuller array of high quality international research on food production, or agricultural production more generally, of prime importance to developing countries;

(iii) the dependence of the system's essentially applied research on knowledge developed by basic research and the need for parallel research on related factors of production.

(b) Develop for the period 1983-87 an indicative plan in terms of the expansion of present activities, the addition of new activities and the financial resources required.

(c) Examine the system's links and relations with the developing countries it is intended to serve and make recommendations for improvement. In this it will consider:

(i) the needs, views and aspirations of the developing countries;

(ii) the differences in national research capacity and likely trends in the future;

(iii) the range of services, including training, to be provided by the system;

(iv) the adequacy of links with the international centers;

(v) how to improve participation by the developing countries in the deliberations of the Group.

(d) Appraise the suitability of the system's structure, organization and governance for implementing the strategy for the next decade. The Committee will particularly consider:

(i) responsibility for policy formulation, planning, decision making, accountability, monitoring and control;

(ii) the adequacy of present organization and processes for exercising these functions, for maintaining the quality of research and for coordinating and rationalizing the responsibilities of the principal elements of the system -- the Group itself, the Cosponsors, the Centers and their Boards, TAC and its Secretariat and the Secretariat of the CGIAR;

(iii) whether basic structural reforms are needed and if so, what should they be;

(iv) if basic reforms are not required, what modifications, if any, to present arrangements are needed.

(e) Address the need for efficiency in the system's operations and use of resources, assess present arrangements and procedures and make recommendations for improvements. It will particularly consider:

(i) the process for establishing priorities in the use of manpower and financial resources by the system as a whole and its individual components;

(ii) the means of ensuring adherence to the priorities established;

(iii) the balance between a center's accountability to the Group for use of resources and the benefits of independence of operation;

(iv) mechanisms for balancing claims and available funding;

(v) whether for the conduct of CGIAR activities there are effective alternatives to the present typical international institute;

(vi) how to ensure that the scarce resource represented by the system's small cadre of scientists is used to maximum advantage;

(vii) the optimum size and likely productive life span of research institutions of the kind comprising the system.

2. In all the foregoing the Committee will concern itself with the Group and the system as a whole and not with individual institutes or programs.

3. The Committee will be served by a staff (the Study Team) which will work under the Committee's direction.

4. It will provide the Group with a report and recommendations in time for consideration by the Group at its meeting in the last quarter of 1981.

Second Review of the CGIAR System

* * *

Provisional Budget

		$'000
Personnel Costs		
Study Team		213
Secretariat Staff		14
Consultants, Research Papers		41
	Subtotal	268
Travel and Subsistence		
Study Team		62
Committee, Other		62
	Subtotal	124
Miscellaneous		
Office Supplies		2
Communications		5
Printing, Data Processing		5
Report, Transcript Preparation		10
	Subtotal	22
Contingencies		51
	TOTAL	465

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1818 H St., N.W. Washington, D.C. 20433 U.S.A.
Telephone (Area Code 202) 477-3592
Cable Address – INTBAFRAD

December 12, 1980

CGIAR Second Review

First Meeting of the Review Committee
January 21-22, 1980
World Bank, Washington, D.C., Room C1006

Provisional Agenda

1. Opening Remarks by the Chairman.
2. Adoption of the Agenda.
3. Purposes and Objectives of the Review.
4. Terms of Reference.
5. Role of the Committee.
6. Character and Timetable of the Committee's Task.
7. Work Plan of the Study Team.
8. Report of the Committee's Secretary.
9. Agenda for the Second Meeting.
10. Other Business.
11. Time and Place of Next Meeting.

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December 12, 1980

CGIAR Second Review

First Meeting of the Review Committee
January 21-22, 1980
World Bank, Washington, D. C., Room C1006

Annotated Provisional Agenda

Item 1 - Opening Remarks by the Chairman.

Item 2 - Adoption of the Agenda.

Item 3 - Purposes and Objectives of the Review.

The general purposes and objectives are set out in broad terms in the Proposal (ICW/80/11 of September 15, 1980) which the Group accepted at its meeting in October 1980, specifiacally paragraph 3 of the Proposal and paragraph 1 of the Terms of Reference in Annex I. Committee members are being sent a copy of the draft informal summary of the group's discussion of the subject. This agenda item will give Committee members the opportunity to identify particular objectives which they believe to be of special importance.

Item 4 - Terms of Reference

As noted above, the Terms of Reference as contained in the Proposal have been broadly accepted by the Group at the Manila meeting and it was not contemplated that they would be redrafted. However, the Terms of Reference have deliberately been couched in rather general terms, and the Committee will wish to consider how they should be followed up in detail and which aspects should have the first call on the Study Team's resources and which, if any, should take second place. They may wish to consider providing the Study Team with a list of specific questions as a supplement to the Terms of Reference. A verbatim transcript of the discussion will be kept, which the Study Team will find useful in organizing their work.

Item 5 - Role of the Committee.

Discussion under this heading should serve to clarify the role of the Review Committee as the instrument of the Group as a whole for conducting the Review and the role of the Study Team as the Committee's staff. Members will recall that they have accepted appointment to the committee in their personal cagacity, but each comes from a beneficiary country, donor, center or TAC and will wish to express his views with these interests in mind. The Committee may consider how members may facilitate the work of the Study Team during the periods berween Committee meetings.

Item 6 - Character and Timetable of the Committee's Task.

The Committee's objective is to prepare a Report, including recommendations, for consideration at the 19th meeting of the Consultative Group, November 11-13, 1981. The first meeting of the Committee is intended to clarify Terms of Reference and decide on the organization and conduct of the Review. The second meeting, May 19-21, will consider the substance of the issues arising from the Terms of Reference and decide on the Committee's recommendations for resolving them. To this end the Team will provide for the May meeting a paper laying out the issues and options. After the meeting the Team will prepare a draft of the Committee's Report to the Group. The third meeting, July 21-22, will consider this draft so it may be put in final form. At the initial meeting members will wish to guide the Study Team as to how the limited time available to them can be most effectively used within this framework.

Item 7 - Work Plan of the Study Team.

The Study Director, Dr. Arnold, will outline the proposed work plan for his Team. The Committee should recognize that the very limited time available has required the Team to set up its travel schedule already, and changes which would add to the work load are not feasible if the timetable is to be maintained. However, the Study Team will welcome suggestions which will enhance the effectiveness of their work plan. Members may be able to suggest knowledgeable contacts in the field, or provide working papers by themselves or others on particular topics.

Dr. Arnold will inform the Committee in detail of the proposed work of the Team during the period between the first and second Committee meeting.

Item 8 - Report of the Committee's Secretary.

The Secretary, Mr. Hayman, will report on matters of interest to the Committee, in particular the status of the Review Fund, and proposed documentation emanating from the meeting.

Item 9 - Agenda for the Second Meeting.

Members will have the opportunity to indicate topics which they would like included on the agenda of the next meeting.

Item 10 - Other Business.

Members wishing to propose items of Other Business are asked to inform the Secretary in advance, if possible.

Item 11 - Time and Place of Next Meeting.

Members have been informed of the proposal to hold the next meeting on May 19, 20 and if necessary 21, 1981, at the Paris office of the World Bank, 66 Avenue d'Iena. This should be confirmed, or another date and place agreed.

DRAFT TERMS OF REFERENCE FOR THE REVIEW COMMITTEE

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(a) Examine and, as necessary, reformulate for the Group's consideration its objectives, policies to be pursued, range of activities to be supported, and level of resources to be sought, testing these for relevance, timeliness, feasibility and promise in the light of the present and changing circumstances of the developing countries and the likely availability of resources. In this the Committee will consider:

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(ii) the choice between supporting agricultural research selectively as needed to fill gaps as against embracing a fuller array of high quality international research on food production, or agricultural production more generally, of prime importance to developing countries;

(iii) the dependence of the system's essentially applied research on knowledge developed by basic research and the need for parallel research on related factors of production.

(b) Develop for the period 1983-87 an indicative plan in terms of the expansion of present activities, the addition of new activities and the financial resources required.

(c) Examine the system's links and relations with the developing countries it is intended to serve and make recommendations for improvement. In this it will consider:

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(iii) the range of services, including training, to be provided by the system;

(iv) the adequacy of links with the international centers;

(v) how to improve participation by the developing countries in the deliberations of the Group.

(d) Appraise the suitability of the system's structure, organization and governance for implementing the strategy for the next decade. The Committee will particularly consider:

(i) responsibility for policy formulation, planning, decision making, accountability, monitoring and control;

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(iii) whether basic structural reforms are needed and if so, what should they be;

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4. It will provide the Group with a report and recommendations in time for consideration by the Group at its meeting in the last quarter of 1981.

Second Review of the CGIAR System

Members of the Study Team

Dr. Michael H. Arnold - Study Director (UK)

PhD, Cambridge. MA, Cambridge. Currently Head of the Sugar Beet Department of the Plant Breeding Institute, Trumpington, Cambridge. Member of the Scientific Advisory Committee of the Institut Internationale de Recherches Betteravières. Chairman of IIRB/IBPGR working group on genetic resources. Consultancies for the UK O.D.A., and CGIAR (ICRISAT Quinquennial Review), among others. Previous experience includes work in East Africa between 1952 and 1972. From 1966 to 1972, Director of the Cotton Research Station, Namulonge, Uganda; thereafter, adviser to the government on Agricultural Research.

Dr. Bryant E. Kearl (US)

PhD, Minnesota. MS, Wisconsin. Vice Chancellor, Academic Affairs, University of Wisconsin, Madison. Previously Associate Dean, Social Sciences, Vice Chancellor and Acting Chancellor. Numerous academic posts in agricultural journalism. Overseas experience includes Federal Republic of Germany; University of East Africa; Agricultural Development Council, Bangkok and Singapore; consulting assignments include those for USAID, ADC, IRDC, USDA. Member of National Academy of Sciences World Food and Nutrition Study.

Dr. Martin E. Pineiro (Argentina)

PhD, California at Davis. MSc., Iowa State. Currently at IICA in Costa Rica, directing the PROTAAL project, concerned with the generation, diffusion, and adoption of agricultural technologies. The project includes a range of different studies and investigations which Dr. Pineiro has been coordinating. Previously, Dr. Pineiro held senior posts in Argentina concerned with the economics of technological change.

Dr. William E. Tossell (Canada)

PhD, Wisconsin. MSA, Toronto. Professor of Crop Science and Dean of Research at the University of Guelph. Involved with international development since the late 1960's. Among other activities in this field, Dr. Tossell has worked with IDRC and was a member of the Canadian Advisory Committee for the CIAT cassava program. He has been a consultant for CIDA, and assisted the Canadian UNESCO Commission.

The team will also be assisted by consultants on shorter assignments. Engaged so far have been:

Dr. H. K. Jain (India)

PhD, Wales. MSc. equivalent, Indian Agricultural Research Institute. Since 1977, Director of the Indian Agricultural Research Institute, having over 1,400 scientific and technical staff, and 14 regional stations. It has the status of a university and Dr. Jain functions as the Vice Chancellor. With a background of plant breeding, Dr. Jain has been responsible for leading the institute's program for the development of high-yielding varieties. Dr. Jain has undertaken numerous consulting assignments. He is a member of the Board of Trustees of CIMMYT.

Dr. H. Messerschmidt (Germany)

Summary CV to follow. Dr. Messerschmidt has wide experience on agricultural problems in developing countries, primarily in the field of livestock.

Secretary to the Study Team

Mr. William J. MacNally.

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1818 H St., N.W. Washington, D.C. 20433 U.S.A.
Telephone (Area Code 202) 477-3592
Cable Address – INTBAFRAD

December 22, 1980

Dr. Elmer Kiehl
Executive Director
BIFAD, Room 2246
State Department
2201 C Street, N. W.
Washington, D. C. 20523

Dear Dr. Kiehl:

Please refer to my telephone conversation with your secretary regarding a visit by the CGIAR Review Study Team to BIFAD. We provisionally arranged that this would take place on the afternoon of March 17, beginning at 2:30 p.m.

I am attaching a List of Topics and Questions which the CGIAR Review Study Team proposes to use as a basis for their work. We would welcome any comments you or your colleagues may have either on these topics or any other matter you consider relevant to the Review.

Yours sincerely,

W. J. MacNally
Secretary to the Study Team

Enclosure

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

Second Review, 1981

MAIN TOPICS FOR STUDY

T1 Purpose

T2 Activities

T3 Donors

T4 LDCS

T5 Centers

T6 Personnel

T7 Organization and Management

November 24, 1980

T1 PURPOSE

The CGIAR and the activities it supports have evolved rapidly since 1971 into what has become known as the "CGIAR System". Those within and outside the system have a range of different ideas on what the goals of the system should be and how they should be reached.

Questions:

1. What are the current advantages of the CGIAR System relative to other means of augmenting agricultural research designed to benefit the LDCs?

2. Is re-definition of the purpose and goals of the CGIAR System necessary?

3. If so, what changes would be desirable in relation to:

   (i) the future purpose of the system

   (ii) its scale and mode of operation

   (iii) the projected life of the system

T2 ACTIVITIES

The question of what range of activities should be funded by the CGIAR is closely related to the purposes of the system (T1). Some would argue that the system already covers the priority activities on an appropriate scale; others would wish to see it continue to expand and to cover activities additional to those already encompassed.

Questions:

1. Should the present array of institutes and range of activities be maintained, expanded or changed?

2. Should research on crop production be widened to include other crops, such as non-food crops, or other aspects, such as post-harvest technology?

3. What responsibility should the CGIAR System have for research and training on the "common factors" of agricultural production (such as pest control and water management) and how could that responsibility best be met?

4. What is the place in the work of the system of socio-economic research related to agricultural production?

5. Is the system adequately supplied with the results of basic research?

6. Are the programs of training adequate and correctly orientated?

T3 DONORS

The indicative plan suggests that the funds to be requested from the donors will increase by about 34% (in real terms) from 1981 to 1985. Some donors consider this target to be unrealistic in relation to policies for foreign aid in their own countries; others accord this aim a high priority and see the CG system as a convenient vehicle for the effective use of aid funds.

Questions:

1. What priority will donors give to agricultural research in their allocation of funds for foreign aid?

2. How committed are donors to the CGIAR system as distinct from other organizations dealing with similar problems?

3. Upon what criteria will donors determine their future contributions to particular activities sponsored by the CGIAR?

4. To what extent will donors accept long-term commitments to funding?

5. To what extent should the developing countries themselves be encouraged to become donors?

6. What is the likely availability of annual funding for the system in the years 1983, 1987, and 1992?

T4 LDCs

One concept of the International Center (see T5) allows for local testing of results but implies that the work will stop short of working in national programs. An alternative view is that the maintenance of this boundary is an impediment to the full exploitation of the output of work of the CGIAR System.

Questions:

1. To what extent do the LDCs recognize a need for the CGIAR System?

2. How far has the work of the system matched up to their expectations with respect to both research and training?

3. How can LDCs cooperate further to enhance the value of the work of the system?

4. How do the LDCs see the future role of the system?

5. Are there adequate mechanisms for coordinating national and regional programs with those of the centers?

6. Are the views of the LDCs adequately represented in formulating the policies and programs of the CG system?

7. What should be the relationship between the work of the CGIAR system and other work sponsored by bilateral and multilateral agencies?

T5 CENTERS

The original concept of a number of multidisciplinary centers of excellence for agricultural research has evolved into one of a complex interrelated web of activities serving agriculture in ways additional to research. Some see dangers in the continued expansion of the work controlled by centers; others regard their wider involvement in agricultural problems as desirable.

Questions:

1. How should existing centers develop during the next ten years?

2. Should centers continue indefinitely to receive international support?

3. What considerations should determine the addition of new centers to the system?

4. Is there an optimum size for centers?

5. What guidelines should be used to determine the scope of "off-campus" work in a center's research program?

6. What practical alternatives are there to the concept of the international center for activities which the CGIAR might initiate in the future?

T6 PERSONNEL

The most valuable resource of the system is its cadre of highly competent staff, many of whom have entered the system after acquiring relevant experience in other organizations. In order to maintain its high professional standards the system must have an assured supply of first-class staff.

Questions:

1. Is the supply of scientists and research managers adequate to maintain the standards of the work?

2. Will existing centers continue to provide productive environments and adequate career prospects for talented research workers?

3. Does competition for staff unreasonably deplete the availability of good scientists and research managers for national programs?

4. What more can be done to ensure that suitable individuals continue to be found for appointment to all the standing and ad hoc bodies associated with the system?

5. Are the present mechanisms for selecting staff and other personnel adequate? If not, how should they be modified?

T7 ORGANIZATION AND MANAGEMENT

Members of the CGIAR are independent entities and do not relinquish any of their sovereignty to the Group as a whole. The Centers are autonomous bodies, each with its own Board of Trustees. The CG Secretariat and the TAC Secretariat operate under the umbrellas of the World Bank and the FAO respectively. Thus there is no central authority and there are no stipulated chains of responsibility.

The system is attractive to donors and has achieved undoubted success. Nonetheless, as it has expanded, problems of organization and management have arisen, particularly those associated with the allocation of resources. Such problems need to be analyzed in relation to the desire of those within the system to retain its attractive features of freedom, flexibility, and relative lack of central bureaucratic control.

Questions:

1. Is the present management structure adequate with respect to policy formulation, decision making, and operational control?

2. What should be the machinery for deciding on the allocation of limited funds amongst competing requirements?

3. What changes in the structure and organization of the system are required and how should they be implemented?

4. What should be the criteria for membership of the CGIAR?

COMMENTS ON CGIAR REVIEW QUESTIONS IN CURTIS FARRAR'S MEMO OF DECEMBER 23, 1980

1. Program priorities:

   a. adequacy of coverage of the needs of countries with worst food production prospects notably, sub-Saharan Africa and hill Asia.

      - Question needs to be extended to semi-arid regions of the world; and arid also. We haven't paid much attention to this belt; it covers large geographic areas and affects large populations. This applies especially to ICRISAT, ICARDA and ILCA.

      - The review should either address (or set in motion the machinery) the question of the appropriate level of effort in the semi-arid and arid areas of Africa. There are questions of whether the present efforts are adequate in relation to the opportunities. We need to determine what is needed and how the effort can best be mounted.

      - Should cover hill regions of the world, not just hill Asia.

b. <u>role of the centers in relation to use of new biological research tools</u>.

- There is a question as to whether the the centers are sufficiently linked with developed countries to have the latest on all research information -- tools, concepts and results.

- Center staffs need to be <u>aware of</u> the newest research techniques.(E.g., it is not necessarily the best approach to run a lot of crosses or trials.) If the staff is aware of the latest techniques, it may for valid reasons choose not to use them.

- Should push external utilization of resources -- through sabbatic leaves, etc.

- Recall that it is CGIAR policy for centers to draw on developed countries to back-up their research. The U.S. has not been doing a particularly good job in relating to the centers.

- ILRAD has been out in front on many research developments; it was designed to operate that way.

2. Interrelationships with CRSP's and other AID-supported research programs:

a. soils
b. water
c. soybeans
d. fertilizer
e. fisheries
f. other topics on which there are existing or planned CRSP's

- CRSPs are a U.S.-only initiative. Other donors may become concerned if CRSPs were to capture a major portion of the centers' efforts.

- Broader question may be how developed country initiatives can best be structured to serve the needs of the centers.

- There is a question of the extent to which CGIAR through TAC identifies priorities for the centers. The study team needs to address the question of the process by which priorities are set and made known to the international community.

- Could stress the interdependence notion and networking concept.

3. Interaction between U.S. agricultural universities and the centers, including the project which BIFAD is planning to propose.

- Some interlocks have been developed between U.S. universities and the centers. Most have been at the initiative of the center directors. Some have been at the initiative of the foundations working through the universities.

- JRC is developing a proposal for a cooperative research program between the U.S. universities and the centers. The main thrust of the program would be back-up research which the centers need to carry out their mission but which they do not have capability of performing for themselves. Secondary thrusts would include predoctoral, postdoctoral and midcareer U.S. scientists conducting research at the centers. The center directors are highly supportive of this proposed program.

4. Working relationships between the Centers, AID Missions, and university contractors in the field.

- See comments under 2b and 3.

5. Long-term role of the centers.

- This is a highly relevant, high priority question.

- The statement on page 2 of U.S. Position is a fairly good one.

- The centers should make sure that their product lines change in line with the needs of their client nations. Some are doing well in this respect, and some not so well. A continuous feedback system needs to operate.

- Questions should be raised on what centers can do better than anyone else as opposed to what others can supply as well or better than they can; how they should evolve over time; how they should be evaluated in terms of their longevity.

- There are questions of the extent to which the centers are meeting their mandate. E.g., what are they doing and what can they do for the poorest countries like some in Africa? They may need increased budgets to fulfill their missions. But are we and other donors willing to put more money into them?

- We need to face questions that cover the range from redirection of center programs to elimination of centers. There are two weak centers. ICARDA has little chance of succeeding with its headquarters in Syria. Research on arid agriculture is needed; if we don't have a center, we need to consider how these needs will be met.

- Question of if, how, when and under what circumstances centers can be terminated. Are we willing to cut out one or more centers?

  Five-year reviews aren't going to answer such questions. Some other mechanism is needed to address them.

  U.S. needs to support such questions, but need not be out in front on them.

COMMENTS ON U.S. POSITION PAPER

P 1 Heavy emphasis on training is o.k. so long as there is need for it in developing countries.

P 1 Think it's a mistake to single out any of the special interests, such as WID. ?

P 3 On the role of TAC, suggest that they concentrate on technical considerations, and that some analytical capability be added to the staff.

P 5 Regional centers are useful but they don't fit the CGIAR system very well. We need a different system for regional centers and networks.

- The questions surfaced by the Study Team are good with the exception of those related to the CGIAR Secretariat, which tend to be self-serving.

- As centers mature, and as countries mature, how will countries evolve into donors? There are questions not only of minimum financial contribution, but of how to get countries involved and participating in a non-parochial way.

- There are also questions of the role of LDCs in managing the system.

List of Participants

Members of the Review Committee

Mr. Warren C. Baum
Chairman

Dr. Eliseu Alves
President, EMBRAPA
Brazil

Mr. David E. Bell
The Ford Foundation

Dr. Nyle C. Brady
Director General
International Rice Research Institute

Dr. Robert K. Cunningham
Chief Natural Resources Adviser
Overseas Development Administration
United Kingdom

Dr. Lloyd T. Evans
Chief, CSIRO Division of Plant Industry
Australia

Mr. Curtis Farrar
Component Coordinator
U.S. International Development Cooperation Agency

Professor Ola M. Heide
Rector, Agricultural University of Norway

Mr. James C. Ingram
Director, Australian Development Assistance Bureau

Dr. Dominic E. Iyamabo
Federal Ministry of Science and Technology
Nigeria

Dr. Amir Muhammed
Chairman, Pakistan Agricultural Research Council

Dr. John A. Pino
Director, Agricultural Sciences
The Rockefeller Foundation

Dr. Richard L. Sawyer
Director General
Centro Internacional de la Papa

Dr. Omond Solandt
Ontario, Canada

Dr. Werner Treitz
Head, Agriculture, Forestry, Fishery and Rural Development
Federal Ministry of Economic Cooperation
Federal Republic of Germany

Dr. Mohammed S. Zehni
Representative of Libya to FAO

Ex Officio Observers

Dr. Dieter Bommer)
FAO)
)
Mr. William Mashler) Cosponsors
UNDP)
)
Mr. Montague Yudelman)
World Bank)

Dr. Ralph Cummings
TAC Chairman

Members of the Study Team

Dr. Michael H. Arnold
Study Director

Dr. Bryant E. Kearl

Dr. Martin E. Pineiro

Dr. William E. Tossell

Mr. William J. MacNally
Secretary to the Study Team

Others

Mr. Michael L. Lejeune
Executive Secretary
CGIAR Secretariat

Mr. Philippe J. Mahler
Executive Secretary
TAC Secretariat

Dr. John K. Coulter
Agriculture and Rural Development
Department
World Bank

Mr. Andrew J. Hayman
Senior Program Officer
CGIAR Secretariat

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

1818 H St., N.W. Washington, D.C. 20433 U.S.A.
Telephone (Area Code 202) 477-3592
Cable Address – INTBAFRAD

February 10, 1981

FROM: The Secretariat

CGIAR Second Review

First Meeting of the Review Committee
January 21-22, 1981, Washington, D.C.

Attached is a draft Informal Summary of Proceedings of the First Meeting of the CGIAR Review Committee.

Please send any comments or amendments to the Committee's Secretary, to reach him by March 17, 1981.

Attachment

Distribution:

Participants

DRAFT
February 9, 1981

CGIAR Review Committee

1981 Review

First Meeting, January 21-22, 1981

Draft Informal Summary of Proceedings

Attendance

1. All members of the Committee, except Dr. Swaminathan, were present. The Cosponsors were represented as observers, and the Study Team were present. A List of Participants is attached as Annex I. The Chairman of the Review Committee, Mr. Warren C. Baum, presided.

Item 1 - Opening Remarks

2. After welcoming Committee members and other participants, the Chairman outlined some of the reasons why a second Review had become necessary. Although less than ten years old, the Group's activities had expanded rapidly, and were now an established feature of the international donor community. The rate of real growth was now slowing down, making it difficult to take on new activities while allowing existing ones to grow. The Group was achieving more prominence, while having to operate in a more difficult financial environment. The correct setting of priorities was becoming ever more important, as was adequate accountability for, and efficiency in,the use of the resources provided. These had to be reconciled with the freedom of center boards, and of research scientists.

3. The Bell Committee had recommended that the Group undertake periodic overall Reviews, and the first had been done in 1976. The Group had agreed that the second Review be organized in broadly the same way as

the first. It would be entrusted to a Review Committee, whose members would be chosen in consultation with the Cosponsors by the Chairman of the CGIAR, who would also chair the Committee. The Committee would be assisted by a Study Team, led by Dr. Michael Arnold. Other members were Dr. Bryant Kearl, Dr. Martin Pineiro and Dr. William Tossell. They would be joined for shorter periods by Dr. H. K. Jain and Dr. H. Messerschmidt.

4. The Committee members had been chosen to be broadly representative of the CGIAR system's constituents. This had resulted in rather a large Committee -- 17 members. Members should express their individual views, which would not necessarily reflect those of the organizations for which they worked.

5. Since most Committee members were insiders, they provided depth of experience of the Group's operations, and also continuity in implementing the Review's recommendations as approved by the Group as a whole. On the other hand, the necessary degree of outside objectivity would come from the Study Team, who would be consulting many informed people within and outside the system, and would be involved in seminars in three regions of the developing world.

6. The Chairman reminded members of the role of the Committee in the Review process. The Committee's responsibility was to present a Report for consideration by the Group. The recommendations as finally agreed by the CGIAR as a whole would be those of the Group itself. The Study Team would provide staff work, but the Report going to the CGIAR would be that of the Committee, not the Team. Should the Team dissent from the Committee's Report in any significant respect, they should have the opportunity to make it known. The full-time Team approach was preferable to forming subcommittees of the Committee, which would not be feasible in view of members' other commitments.

7. The Review timetable was extremely tight, dictated by the need to produce the Report in time for consideration in early November 1981. The current meeting would review the Terms of Reference approved by the Group, examine priorities, identify any significant gaps and consider the plan of work. Two further Committee meetings would be held -- on May 19-21 and July 21-23, 1981. The May meeting would resolve issues identified by the Team, and the July meeting would consider a draft of the Committee's Report.

Item 2 - Adoption of the Agenda

8. The Agenda was adopted without change, but recognizing that discussion could well cover items falling under more than one agenda heading.

Items 3 and 4 - Purposes and Objectives of the Review, and the Terms of Reference

9. The Chairman noted that the Proposal setting out the purposes, organization and Terms of Reference of the Review had been considered and adopted by the CGIAR at its last meeting. Many Committee members had participated in the Manila meeting, and the record of the CGIAR discussion was available. He reminded members of the main purpose of the Review, as set out in paragraph 3 of the Proposal of September 15. There were four main areas for the Review to address -- the CGIAR's strategy for the future; the relationship between the Group and the developing countries and, implicitly, with donors; the structure, organization and governance of the system; and efficiency in operations and use of resources.

10. A speaker drew a distinction between relations between the Group and the donors, and those between the centers and donors. This led to some discussion of the meaning of the "CGIAR system", but without any precise definition being proposed. It was noted that the primary purposes of the

centers, and those of the CGIAR, might well differ. However, it was subsequently clarified that the centers should be seen as an integral part of the CGIAR system.

11. A speaker felt it would be a mistake to move too rapidly into the detailed aspects of the Review without first providing for an assessment of the needs of the developing countries, essentially for food, and of the significance and importance of the CGIAR research effort in trying to meet those needs. Hence a judgement could be reached on the appropriate level of effort that should be put into CGIAR activities. While he did not advocate a lot of original quantitative work, he stressed the need for fundamental judgements on future food needs, and the role of research in meeting them. The situations of the international centers, of the national programs, and of the relations between the two, were all changing.

12. This view stimulated considerable discussion, leading to a consensus that the Committee's Report should draw on available work to begin with an overview of the world situation within which the research supported by the CGIAR had to achieve the most effective impact. Dr. Arnold noted that his Team had discussed with IFPRI the possibility of input from them on such questions. The need to focus on a manageable number of issues was also stressed.

13. Issues of governance, and in particular, means for allocating scarce resources, would be a most important concern for the Review. The Committee considered plant breeders' rights an important issue arising from the application of patent law to plant breeding. This could inhibit the free exchange of germ plasm, had implications for center personnel policies, could delay the release of material, and had already created serious difficulties for some, Dr. Brady quoting an example from IRRI's experience. It was felt

that these might be short-term problems, which might have been exaggerated. The Study Team included expertise on the question, and could examine it in broad terms, noting that TAC and the IBPGR, among others, had it under review.

14. A speaker reminded the Committee of the findings of the first Review, which he felt was a good one. He queried the extent to which questions raised in the first Review, such as the optimum size of a center, had been answered, or its numerous recommendations implemented. If they had not been, it would be instructive to know why. The Chairman agreed, and said that the Secretariat's 1979 paper[1/] on implementation of the first Review would be circulated to the Committee.

15. A number of speakers felt that future support for the CGIAR would hang more on conviction as to the relevance of its work, than on questions of research quality, or management. One speaker felt the Group might have been too complacent in the ~~fact~~ past in assuming that the focus of its work was correct. A fresh look was needed to see whether some important agricultural problems were being ignored. At the same time, the CGIAR could not be expected to solve all the world's agricultural problems.

16. A speaker emphasized the importance of the broadest application of the research results of the centers. ISNAR had a role which he, and others, felt needed clarifying. Another speaker, also referring to application of the results achieved by the centers, felt that they got far less credit than they deserved, partly through the policy of releasing varieties through national programs.

17. Noting the need for the Study Team to have substantive discussions with ISNAR, another speaker felt the CGIAR system's success, and the success

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1/ Will be attached as an Annex to the final version of this Summary.

of the centers, in strengthening national programs should be evaluated.

18. Noting a range of different objectives and interests at different levels in the CGIAR system, a speaker pointed to the difficulties of defining objectives for the system as a whole, particularly since the role of the centers was changing, away from what he felt was the element of paternalism of the early years, towards being nodes in a wider network. A center director, however, felt that the centers had not changed greatly.

19. Although in relation to development aid in general the resources going to the CGIAR were very small, they were becoming quite visible to donor agencies, many of which had an unclear picture of what the CGIAR was or did. The Review should provide a clear definition of the place of the CGIAR in agricultural development, if financial support were to be maintained. A survey by one donor agency had revealed a variety of misconceptions about the system. In fact there were many "systems" embraced by the CGIAR concept.

20. The Committee was urged to examine the system's different responsibilities -- for example a commodity focus as against a regional approach, or a food production approach; or the extent to which the orientation should be towards the resource-poor farmer.

21. A Committee member mentioned his own experience in building up a research facility from scratch in a developing country faced with severe agricultural problems, political tensions, and some official skepticism about the value of science. He quoted the problem of insufficient trained manpower, without proper facilities or appropriate conditions of service. He attached great importance to the right kind of training, suited to his country's needs. He also quoted the harmful effects on production of inappropriate price policies, which he felt indicated stronger emphasis to the work of ISNAR and IFPRI.

22. The discussion touched at a number of points on the growing technical assistance role of the centers. If this continued, the type of person attracted to working in the centers would change, perhaps for the worse. A center director, however, distinguished between technical assistance and cooperative research, the former being typically arranged through Special Projects.

23. A Committee member, who directed a large and successful national research program in a developing country, emphasized the importance of institution-building. Good agricultural research was essential to solve agricultural problems, even where, as in his case, there remained much land to be developed. He, too, stressed the importance of convincing the politicians. His own system had benefitted from contact with the international centers.

24. A speaker urged the Study Team to consider whether in future additional resources might be more effective if channelled to national rather than international programs. He felt there were cases where national programs had been hindered by the existence of an international center.

25. Another speaker hoped that the centers would remain as centers of excellence. The extent to which they should be involved in technical assistance, development work, or political persuasion at the expense of research needed to be addressed.

26. A number of speakers noted that the international centers were at different stages of development. Initially, a center's own credibility had to be established. Mature centers developed strong collaboration with national programs.

27. A speaker gave illustrations of a number of concepts of the CGIAR. One was the gap-filling concept: another was substitution for weak national

programs: another was diffusion of technical knowledge: then there were the different foci that had emerged over time -- from commodities to animal science to ecology. He felt that an important task for the Committee was, as set out in paragraph 1(a)(i) of the terms of reference, to define the place of the CGIAR system within the total agricultural research effort addressed to the developing countries -- comprising developing countries' national programs, regional programs, programs in the industrialized countries and in the private sector.

28. Since the international centers benefitted developing countries, their resources came almost entirely from aid funds. The EEC had taken an interesting new direction in using its regular financial resources to put research facilities and personnel at the disposal of the developing countries.

29. As the discussion progressed various views were expressed as to the desirable scope of the review. The Chairman felt different Committee members had two distinct concepts of the scope of the Committee's task. One concept was that periodically the Group should concern itself with practical operational questions, such as priorities, allocation procedures, the role of Boards and of TAC, improved accountability and so on, which could lead to important changes at the margin to the system at present in place. The other concept was that periodically the Group should make a more fundamental examination of its purposes and ask itself what kind of problems it ought to be attacking and whether it was on the right track. The second approach was intellectually more exciting and appealing, but he felt the answers to these more philosophical questions would be elusive and the Committee might spend a lot of time on them without resolving them. However, that was only a hypothesis, and it might be that some of these broader questions were critical to the functioning of the system and relevant to the operational

questions given emphasis under the first approach. Nevertheless he felt the Committee would probably need to choose or compromise between these two approaches.

30. A speaker felt that there should be better reporting on the system's achievements. Presentations at Centers Week were not always adequate. He considered whether the Integrative Report could be produced in more "presentable" form, which would appeal to readers in donor agencies.

31. A point raised by a number of speakers indicated that they saw the end product of the Review process as providing a means to convince donors of the need for continuing and increased support for the CGIAR. The Chairman envisaged the Review Report as designed for wide distribution to a mainly lay audience.

32. Committee members who had been concerned with the setting up of national research programs, widely different in their degree of success, outlined some lessons from their own experience. One speaker, whose agency was heavily involved in technical assistance for all aspects of agricultural development, emphasized the frustration often experienced in strengthening national programs, and the inhibiting effect this had on the application of the work of the international centers. Another speaker, recognizing the role of ISNAR in this respect, felt that national policies could be best influenced by an integrated approach involving ISNAR and scientific research workers. Throughout the discussion, a number of speakers felt that the international system would judged by the effect it had on strengthening national programs. A speaker felt the Review should consider the conditions necessary for that strengthening to take place.

33. A speaker thought that the definition of what comprised the CGIAR had changed over time, and needed clarification. He wondered whether the proliferation of reporting requirements, and the tendency of donors to do their own reviews, reduced the Group's usefulness. Another speaker noted that the Review process invented for the Group was designed to minimize reporting requirements. The Chairman felt that donors continued to rely heavily on the Group's review process. He underlined another speaker's point about the importance of full developing country participation in the Group's business.

34. More than one speaker warned of the danger of too complacent a view of the CGIAR system. Various models had been tried, and of the many different activities supported, some had been more successful than others. These would need hard examination, particularly since financial resources were likely to be limited for the foreseeable future. New activities could probably only come in if old ones were reduced or eliminated. Keeping abreast of inflation would be difficult enough.

35. Some speakers drew attention to the need to look for new sources of funding for the CGIAR. One suggestion was for a system of cost-sharing by the more affluent developing countries. Attracting additional funds did run the risk of intensifying competition among centers.

Items 5 and 6 - The Role of the Committee. The Character and Timetable of the Committee's Task.

36. The Chairman reminded members that each served in his individual capacity, and was not representing a particular agency. The Committee's work would be finished when its Report was presented to the CGIAR. Many of those serving on the Committee would be involved subsequently, in the course of their normal work, in implementing the recommendations finally approved by the Group. The relationships between the Committee, the Study Team, and the Group had been clarified in the course of discussion earlier in the meeting and not much further consideration was required under the agenda item.

Item 7 - Work Plan of the Study Team

37. The Chairman drew the Committee's attention to the comprehensive Work Plan prepared in detail by Dr. Arnold. The timetable was tight, and the program ambitious.

38. Dr. Arnold sketched the background to his Work Plan. Working from the Terms of Reference, he had identified seven main topics, mostly interrelated. The Team's resources, mainly time, then had to be allocated to field work, information gathering, analysis, synthesis, and report drafting. This had been done on a system of work modules. While the Team wanted to consult as widely as possibly, some diminishing returns would set in to the extent that the same views became repeated. The Study Team would consider problems and synthesise solutions collectively, but in order to cover as much ground as possible had to work as individuals to some extent. The Group had strongly endorsed the idea of bringing together a number of national research workers

and other officials from developing countries in regional seminars. Extra funds had been provided for this purpose, and one was being organized for Africa and another for Asia. Documentation, including a list of discussion topics, had been sent out. ISNAR would take the opportunity to have its own meetings with participants after the CGIAR Review seminars were over. In addition, a member of the Team would participate in a seminar for Latin America, being organized by IFARD.

39. The Team would reassemble in Washington around March 23, and would prepare an Issues and Options paper for distribution to the Committee by the third week of April. The Committee's discussions had already proved useful in stressing the need for a clear statement of the options, and also for an introductory section for the Report, describing the general environment in which the Group operated, and hence giving the framework for the second Review. The first Review should be taken as the starting point, and the extent to which it had affected people's perceptions of the CGIAR, and its success, in stimulating improvements in CGIAR operations, might be assessed. The statistical information in the Report of the first Review could be updated.

40. In answer to a question, Dr. Arnold said that the timetable would not permit a draft Review Report to be made available for the June meeting of TAC.

41. Two speakers emphasized the importance of getting an adequate input from Asia. They hoped this could be secured to a greater extent than the Work Plan suggested. Note was taken of the Asian seminar, and of visits already made to centers in Asia. Dr. Arnold pointed out that Team and Committee members, for example Messrs. Muhammed, Jain, Swaminathan, Coulter and Kearl had extensive knowledge of Asia.

42. Stressing the importance of distinguishing between developing countries in different stages of research capacity, Dr. Muhammed invited

Team members to visit Pakistan, if that could be arranged.

43. Members expressed some difference of view as to how general the circulation of the Report should be. A distinction was drawn between the Committee's report, which it was generally thought should be a frank internal document, and the final Report of the CGIAR, which might be for more general circulation. Other possible means for spreading information about the Group were mentioned, such as a book or a film. A related issue was the need for an archive for the system. The Team should feel free to advise on such questions.

44. Asked why no observers were to be admitted to the African seminar, Dr. Arnold pointed out that this had been at the express wish of the African organizers of the seminar.

45. It was noted that neither the Terms of Reference, nor the Team's List of Topics, made explicit mention of helping resource-poor farmers and women. In the latter regard, a speaker noted the shortage of women throughout the CGIAR system.

46. The Chairman emphasized that the Team was working for the Committee, and was free to examine any issue it felt fit, including relationships between Cosponsors, operations of the Secretariats, and so on.

47. The Team was reminded of the training efforts beginning to be organized by ICRA. They were referred for information to Dr. Luning at Wageningen. The great importance of training, including training and career development within the international centers, was stressed by a member from a developing country.

48. Agreeing that the Team should examine the extent to which the CGIAR system should be engaged in, or making use of, more basic research, Dr. Arnold

noted that a member of his Team had recently written a booklet on a related subject.

49. Concern was expressed for ecological and energy-related issues, and the importance of work on nitrogen fixation and fuel wood was emphasized. On these and other technical issues, Dr. Arnold expected to draw on the experience of TAC.

50. A member expressed the strong wish for the Review to evaluate the criticisms which were frequently levelled at the Green Revolution, which was sometimes being blamed for every agricultural problem. It was hoped that the Report's introductory chapters would bring this out.

51. Referring to the range of management issues that the Review would address, a speaker felt that, as the Group grew and as the allocation of scarce funds became more difficult, so the tenet of independence of centers became harder to sustain in reality. More formal coordination became inevitable as activities tended to overlap. Positive, but not bureaucratic, management was needed. The same speaker, turning to the role of TAC, felt some of its original functions had become irrelevant, and its future role, if indeed it had one, called for hard examination. Another speaker felt the usefulness of TAC's Quinquennial Reviews needed examination. He doubted whether they were cost-effective.

52. Attention was drawn to the problems of terminating activities which were of low priority. This might call for setting up a centrally-run revolving fund to provide for running down programs. There were different levels of decision making, but the importance of the role of Boards of Trustees was repeatedly stressed. In this connection, there was a problem of timing insofar as Boards agreed budgets before TAC's consideration of them. One speaker suggested that budget problems might be solved by a conference of center Chairmen.

53. A speaker felt the system used for resource allocation for higher education in Australia would be relevant. It reconciled autonomy with good financial management. He would give the Team a document on the subject.[1/]

54. A center director noted his colleagues' resistance to what they perceived as the growing power of TAC, and also their recognition of the very small resources available to the CGIAR Secretariat. He felt TAC should have more responsibility in the system, be comprised of people of the highest competence, perhaps serving for longer terms, maybe some on a nearly full-time basis. Other speakers noted the need to enlarge the pool of qualified people from which TAC and Board members could be drawn.

55. Dr. Arnold agreed with a speaker who felt the need for a factual description of how the CGIAR system actually worked in practice. Such a paper was being prepared as a working paper for the Team.

56. The Chairman pointed out that much more ground had been covered in the discussion than the Team could possibly hope to study in the time available. Extending the timetable was not desirable. The Committee had to be realistic about what could be achieved, but at the same time produce a manageable, useful, and constructive Report.

Item 8 - Report of the Committee's Secretary

57. Mr. Hayman reported on the financial arrangements for the Review. Expected contributions were adequate to cover the Budget, now estimated at $468,000. He hoped that prompt payment by donors would enable cash flow problems to be avoided, as the Review entered its most expensive phase. He also outlined his proposals for meeting documentation, to which there was no dissent.

1/ A summary by ADAB of this book will be annexed to the final version of this Informal Summary of Proceedings.

Items 9 and 10 - Agenda for the Second Meeting. Other Business.

58. The first item had been implicitly covered in the foregoing discussion. There were no items of Other Business.

Item 11 - Time and Place of Next Meeting

59. The Committee will meet on May 19, 20 and 21, 1981, at the offices of the World Bank at 66 Avenue d'Iena, Paris.

m: cellar

D: Background

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Consultative Group on International Agricultural Research

Report of the Review Committee

January 1977

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH
REVIEW COMMITTEE

INTRODUCTORY NOTE

The following report was circulated to the members of the Consultative Group on International Agricultural Research in October 1976.

At the Group's meeting in Washington in late October, two days were devoted to a wide-ranging discussion of the report and its recommendations. The Group decided that, rather than extensively editing the report to take account of this discussion, the text would remain unchanged, but a brief summary of the main points arising during the meeting would be included in the final version of the report.

This summary is given in the pages immediately following.

CGIAR Review Committee

Condensed Summary of Discussion of the Committee's Report, October 27-28, 1976[1/]

In reviewing the Report as a whole, members generally supported its conclusions and recommendations, and considered that the Review had been timely and useful. Some members felt the need for a longer-term perspective than the Report provided, which might be given in a subsequent review. It was noted that the Report was generally cautious and conservative in its approach to the work of the Group over the next several years.

The dangers of too much bureaucracy were stressed, particularly in view of the importance of maintaining the individuality of the Centers, the autonomy of their Boards, and the flexibility of their programs. There should be caution about attempting to set too rigid criteria for the priorities of the Centers, and for their optimum size, but the value of long-term planning was stressed. Other general points on which a consensus was reached included:

-- The Report was regarded as essentially an internal document for the guidance of members of the Group. It did, however, contain much information of general interest.

-- The Report tended to confirm the recommendations of the TAC on emphasis and priorities.

-- New initiatives would continue to come under the Group's consideration, but it would be unwise to attempt to take on too much.

Recommendations 1 - 4 (Scope of the CGIAR)

The Group generally endorsed these recommendations. There was support for a period of consolidation, though this did not imply stagnation, nor indeed that some growth would not continue. It was felt that the CG could have a limited role as a forum for discussion of matters beyond the confines of the system of research financed by the CGIAR but relevant to its overall research mandate. TAC should continue to explore new initiatives during this period. In reviewing Recommendation 2 (that the CG focus primarily on increasing production in food-deficit countries) the Group noted the need to maintain the emphasis on problem-oriented research that benefitted the majority of farmers in low-income countries and on commodities representing important sources of food for the developing countries.

1/ A full summary of the proceedings of the Consultative Group meeting is available from the Secretariat.

Recommendations 5 - 11 (Center and Inter-Center Issues)

The discussion generally supported the spirit of the recommendations, which were based on the recognition that potential demand on the Centers, including demand for assistance to national research programs, greatly exceeds their capacity. The tabulation of appropriate cooperative activities with national programs (p. 82) was endorsed. There was general agreement on the underlying basis for the recommendations and on the need to review programs as a complete whole and to plan well ahead. The question of how Centers' activities could best be classified was referred to the Secretariat for further consideration.

Centers should not be regarded as being necessarily of indefinite life, and individual programs might need periodic rejustifying.

Recommendations 12, 13 (Membership of Boards and Staffing of Centers)

The Group stressed the importance of Board appointments and endorsed the proposal that, subject to legal constraints, the Group should participate in the appointment of three members of each Board. Where this was not already the case, Boards would be invited to consider how it might be achieved over the course of time.

Respecting staff, it was emphasized that there was a need for Centers to attract staff from as wide a field as possible.

Recommendations 14, 15 (CGIAR and Center Review and Evaluation)

Whilst there was some caution expressed about carrying out too many reviews, there was general agreement on the importance of evaluating the success of research in achieving its goals of providing the technology for increasing farmers' production. Future reviews of the system as a whole should include a long-term perspective. Efforts should be make to expand the role played by representatives of developing countries in the review process.

Recommendations 16 - 18 (Budget Planning and Development)

It was noted that an effect of the recommendations would be to increase the workload of TAC and the Secretariats, but this was thought to be manageable, and the recommendations were generally accepted.

The view was strongly expressed that a rigid approach to the size of Centers should be avoided, yet it was also generally recognized that Centers could get too big, consequently changing their character and perhaps their efficacy. The largest Centers may be approaching the optimum size, but this question should be approached first through scrutiny of the Center's program. Centers would be doing more forward programming, with implications for numbers of staff and financial needs.

Recommendations 19, 20 (Budget Allocation)

There was support for the view that donors should be as flexible as their rules allowed in the allocation of funds. There was some discussion of the value of a Standby Committee, since existing procedures for allocation of funds seemed to have worked reasonably well. TAC would be able to advise on relative priorities.

It was concluded that the members of the Committee should be selected with a view to dealing with funding shortfall problems, though it might deal with other types of emergency. If necessary, it could be expanded or otherwise modified, on an ad hoc basis. There was general acceptance of Recommendation 20 on the understanding that the Chairman would appoint the Committee, which would be small enough to be effective and large enought to be representative. He would establish it at the appropriate time and activate it as necessary.

Recommendation 22 (Donor Contributions and Cash Flow)

Donors were being asked to provide pledged funds as early as possible in the fiscal year. The Secretariat would provide Centers and donors with a schedule of requirements and availability of funds. If these did not solve the cash flow problem, it was recommended that the World Bank explore alternative solutions. The problem appeared to be solving itself, largely due to the progress one principal donor had been able to make towards earlier payment.

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

1818 H St., N.W. Washington, D.C. 20433 U.S.A.
Telephone (Area Code 202) 477-3592
Cable Address – INTBAFRAD

TO: Members of the Consultative Group on International Agricultural Research

The Consultative Group on International Agricultural Research was established in 1971, and since that time has experienced dramatic growth in terms of membership, the size and number of activities supported by it, and the resources provided by its members to fund them. In 1975 the Group decided to review the scope of its activities and the programs supported by it so as to plan its future role in promoting research for the development of agriculture, particularly food production, in developing countries.

A Review Committee was established to carry out this task. The Committee members, fifteen altogether including their chairman, each serving in his individual capacity, were chosen for their understanding and experience of the various aspects of the CGIAR system and the several constituencies--developing countries, research centers and CG members--served by it. The members were:

Warren C. Baum, Chairman of the CGIAR and Vice President, Projects Staff, World Bank

David E. Bell, Executive Vice-President, The Ford Foundation

Dieter F. R. Bommer, Assistant Director-General, Agriculture Department, FAO

Sir John Crawford, Chancellor of the Australian National University, Chairman of TAC

Ralph W. Cummings, Director of ICRISAT

*Robert K. Cunningham, Principal Agricultural Research Adviser, Ministry of Overseas Development, United Kingdom

Gerrit de Bakker, Permanent Representative of the Kingdom of the Netherlands to the Food and Agriculture Organization and the World Food Program

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*Dr. Cunningham was unable to attend the final meeting of the Committee. His place was taken by W. Denis Maniece, Ministry of Overseas Development.

Curtis Farrar, Assistant Administrator for Technical Assistance, United States Agency for International Development

W. David Hopper, President, International Development Research Centre, Canada

Hidetsugu Ishikura, Director-General, Japan Marine Science and Technical Center

William T. Mashler, Senior Director, Division for Global and Inter-Regional Projects, United Nations Development Programme

Hussein Mirheydar, Deputy Minister, Ministry of Agriculture and Natural Resources, Iran

Armando Samper, former Chairman of the Board, Centro Internacional de Agricultura Tropical, Colombia

Bukar Shaib, former Chairman of the Board, International Institute of Tropical Agriculture; Permanent Secretary, Federal Ministry of Water Resources, Nigeria

Alfred Wolf, Program Adviser to the President, Inter-American Development Bank.

To serve the Committee as staff, a four-man Study Team was appointed. It began its work early this year and, with the issuance of this report, completed its task at the end of September. Members of this Study Team were:

Dr. Alex McCalla, Study Director
Professor of Agricultural Economics,
University of California at Davis

Dr. Ewert Åberg
Professor, Department of Plant Husbandry,
Agricultural College of Sweden
Uppsala
Sweden

Dr. James McWilliam
Professor and Head of the Department of
Agronomy and Soil Science,
University of New England, Australia

Dr. Arthur Mosher, formerly President of
the Agricultural Development Council (ADC)
and now consultant to ADC.

The terms of reference of the Committee were broadly established by the Consultative Group at its October meeting in 1975, and subsequently refined by the Committee itself. They are set out in the introduction to this report.

This is the report of the Review Committee--which accepts full responsibility for it--but it is very much the outcome of the work of the Study Team. We of the Committee are heavily indebted to the Study Team for their untiring efforts and sound advice. Purposely, they were selected from outside the CGIAR system. In the short time available for their task, they have acquired a comprehensive understanding of the system and a firm grasp of its aims and problems. The Committee has been served outstandingly well.

On behalf of the Review Committee, I herewith transmit to the Consultative Group the report of the Committee.

Warren C. Baum
Chairman

October 1976

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SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This report presents the results of a review of the Consultative Group on International Agricultural Research (CGIAR) and its family of activities. The review was conducted by an *ad hoc* committee with staff assistance provided by a study team. The report is in two parts. This section presents a summary of Part A of the report and the conclusions and recommendations resulting from the analysis in Part B of the report. The problem setting, the analysis and more complete conclusions are presented in the main body of the report.

CONTEXT AND BACKGROUND

Part A of this report concludes, on the evidence of the Koffsky[1/] findings and other analyses of the world food needs, that there is an urgent need to increase food production in those developing countries where large food shortages threaten over the next decade and beyond.

Agricultural research represents only one of the important approaches among the universe of activities that are necessarily involved in expanding food production. It represents the most important way of raising the technical ceiling, but alone is not a sufficient means of meeting the world's food problem as there are many other interacting factors involved.

With respect to agricultural research, it is important to recognize the highly interactive and dynamic nature of the problem and the desirability of adopting an interdisciplinary approach. Goals must

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1/ See Annex.

be defined clearly and a sufficient degree of freedom and independence allowed in choosing them and the approaches to be used in solving the associated problems.

The present status of international agricultural research is characterized by the diversity of organizations and funding sources involved including national and regional organizations and bilateral donors and by the wide scope of their activities. The International centers and other activities supported through the CGIAR represent only a small component of this effort, but although the scope of their activity may be limited, they are of great significance.

There is a high degree of complementarity between the centers' research and that of other agencies in the field. The centers face pressures and inducements to become involved in a wider range of activities such as technology transfer and extension. However, we support the view that the centers should continue to concentrate on what they do best and should not try to do too much.

Finally the development and fiscal history of the CGIAR were reviewed. The important observations are that the Group is still only five years old and is developing rapidly both in the number of activities it supports and in terms of its financial needs. Five relatively new centers will not be completed and staffed for several years and the four oldest centers are still evolving.

CONCLUSIONS AND RECOMMENDATIONS

SCOPE OF THE CGIAR

It is against this background that the future need for and scope of the CGIAR is analyzed. There is need for increased efforts to improve

world food production. Research will continue to play a crucial role. Therefore the CGIAR is an important element in that process and will continue to be needed for the foreseeable future. The CGIAR currently focuses on research and technology development related to food commodities which are widely consumed in the developing world. We conclude that the focus is appropriate and that the commodity coverage is broad, though obviously not fully inclusive of all needs. This focus should be continued and the CGIAR should be cautious about assuming responsibility for major new activities, such as direct support of extension efforts or national programs. Many of the centers, as well as the CGIAR itself, are still in the formative stages and there is need to bring existing centers to maturity and to limit the administrative load on the CGIAR.

We do believe, however, that the CGIAR could make a useful contribution to better articulation of its and others' efforts if it were to engage in analysis of key issues and promote the exchange of information by organizing fora under its auspices.

We have analyzed potential costs of current activities supported through the CGIAR for the next five years under alternative assumptions. Costs will continue to grow, though at a less rapid rate than in the past, provided no new major financial commitments are undertaken. This analysis, coupled with a review of potential fund availability, suggests that the rate of cost increase for the next few years necessarily must be moderate.

We therefore conclude for all of these reasons -- the appropriateness of the current focus, the need to bring centers to maturity, the potential limitations on the administrative capacity of an informal

organization such as the CGIAR and financial realities -- that the next three years should be considered as a period of consolidation. However, during that period TAC should continue to explore needs for modifications in existing programs and for potential new programs, and should make such recommendations to the group as it deems appropriate.

The following recommendations are based on this analysis and the conclusions resulting therefrom.

Recommendation 1: *The need for a sustained research effort to increase food availability in developing countries will continue and is likely to increase. Therefore, we recommend that the Consultative Group on International Agricultural Research proceed on the basis that it should continue to function for the foreseeable future (pp. 58-60).*

Recommendation 2: *We recommend that the CGIAR should continue to endorse TAC's conclusion that the primary focus of the CGIAR should be to support research and technology development that can potentially increase food production in the food-deficit countries of the world. The research activities supported by the CGIAR are appropriately focused on food commodities which are widely consumed and collectively represent the majority of the food sources of the developing world and no major changes or additions are called for at this time (pp. 61-63).*

Recommendation 3: *We recommend that the next three years should be viewed by the CGIAR as a period of consolidation. During this period continued support should be provided for the current set of centers and related activities. We caution against undertaking initiatives requiring major financial commitments. TAC should continue during this period of*

consolidation to explore the need for new initiatives and changes in existing programs (pp. 61-74).

Recommendation 4: *In addition to the current practice of receiving reports from related activities such as IFDC, IFPRI, AVRDC, and CGFPI, we recommend that the CGIAR should support fora for information exchange among members of the Group, technical personnel from their agencies, centers, other aid agencies and national programs in developing countries. In this connection the CGIAR should consider two specific activities (1) commissioning papers as a basis for discussions of CGIAR issues of interest to donors and research beneficiaries and (2) explicitly seeking to foster increased information exchange among CGIAR donors and related agencies about other activities in which they are jointly involved (pp. 61-63).*

CENTER ISSUES

Scope, Balance and Boundaries of Center Programs

The research program of a center or related activity should achieve a functional balance between the major program thrusts. For most centers these include commodity research, often framed within a systems approach, cooperation with national programs in LDC's in both commodity and socioeconomic research, other off-campus activities involving interactions with advanced research institutions, training, and conferences. These components are interdependent and it is essential that all the projects undertaken by centers be regarded as components of their total integrated program.

A number of factors can potentially distort the balance and integration of components of the program. One of these is cooperation with

national programs (formerly known as outreach). Although this cooperation is a vital component of the research mandate of all centers, the demand on the centers to help strengthen national programs throughout the developing world greatly exceeds the capacity of the system to respond. Extensive involvement can distract a center from its primary research mission and place an undue burden on center management. Another factor is the existence of two sources of funds for center programs, one derived under the aegis of the CGIAR and the other from independent bilateral contributions. This has led to the practice of identifying programs by the source of funds which can have a divisive effect on center programs. Our conclusion is that these influences can be contained by adopting appropriate boundaries for cooperative work with national programs and implementing the concept of an integrated program. The entire program should be covered by the centers' program and budget papers and subject to general review procedures adopted by the CGIAR. To achieve appropriate program balance and integration we make these recommendations.

Recommendation 5: *We recommend that all projects undertaken by a center be regarded as components of its total integrated program regardless of sources of funds and that the entire program be subject to the review procedure as outlined in this report (pp. 75-76).*

Recommendation 6: *We recommend that each center develop an objective set of criteria for program choice and periodically reassess the balance of its program with respect to: (1) research and technology development, (2) training, (3) cooperation with national programs and advanced research institutions; and (4) communication and exchange of information*

between center scientists and others in related fields (pp. 76-79).

Recommendation 7: *We recommend that centers continue to develop and strengthen their cooperation with national programs, insofar as this is essential to accomplish their research mandate. Beyond this centers should remain alert and responsive to additional opportunities for cooperation to the extent that extra-core funds are available, that these activities do not compromise or distort the central research mission of the center and that they are within the centers' capacity to staff and manage (pp. 79-84).*

Recommendation 8: *We recommend that all support to a center other than that provided through the CGIAR be classified as extra-core funding. Further, we recommend that these funds be used to supplement activities supported by core funds and/or to finance activities that the center may wish to undertake primarily to benefit a particular country (pp. 84-86).*

Recommendation 9: *We recommend that any proposal for a new project to be supported by extra-core funds should be forwarded by the center to TAC for review when (1) there is a question as to whether the purpose of the activity lies within the center's mandate, (2) acceptance has implications for future core support, (3) the proposed activity might put undue additional strain on center management, or (4) the extra-core funding is particularly large (pp. 84-86).*

Recommendation 10: *We recommend that all centers develop more effective forward research program planning procedures and include as advisors international scientists with competence in the appropriate areas (pp. 88-89).*

Inter-center Relationships

As centers become more active in cooperating with research agencies in developing countries, opportunities for inter-center collaboration have increased. This is highly desirable and will enhance the effectiveness of the centers' programs and enlarge the impact of their technology in these countries. Because a number of these centers work with the same commodity and have interests in the same regions of the developing world, it is important that they avoid competition. To this end, the special strengths that centers may have in particular activities or commodities and their location in relation to the target areas should be taken into consideration in developing formal agreements between the centers concerned.

We believe that the initiative to develop such linkages and the fiscal and administrative arrangements are a matter for the center director and the respective boards of trustees. TAC and the CGIAR should be available to assist in resolving disputes should this be necessary.

Recommendation 11: *We recommend that centers should be encouraged to collaborate wherever possible in executing their cooperative research activities with national programs when working in the same region or with the same commodity. The negotiation and administration of these linkages should be the responsibility of center directors and the respective boards of trustees. TAC or the CGIAR should serve only to advise and assist in reaching a solution in the case of disputes that cannot be resolved by the centers. Further, we recommend that agreements and arrangements between centers be formally recorded in writing and a copy of all such agreements be sent to the CGIAR Secretariat (pp. 89-90).*

Center Management

The boards of trustees perform a valuable role in conjunction with the director and his staff in developing and reviewing the programs and budgets of the centers. They are an essential element in the maintenance of the quality and independence of the centers.

To preserve the high caliber of board membership, we conclude that boards should define their own criteria for the selection and appointment of board members and that these should contain provision for: balanced representation of expertise in relevant fields, openness and vitality of boards, and for expanded efforts to broaden the search for new members, including more active participation by donors.

In relation to staffing issues, the reputation and success of the CGIAR and the individual centers is largely a reflection of the caliber and performance of the scientific staff. Every effort should be made to maintain staff vitality through sound leadership, regular contact with scientists in similar fields, increased opportunities to publish and enlightened personnel policies. Further, recruitment policies should be more open and every effort made to identify new staff from the widest possible cross section of potential applicants. With these issues in mind, the following recommendations are made.

Recommendation 12: *We recommend that each board of trustees define criteria and procedures for the selection and appointment of its own members and that these be made available to the CGIAR. Further, we recommend that each board of trustees broaden its membership by including, when appropriate and consistent with national laws, three members selected in conjunction with and ratified by the CGIAR (pp. 91-92).*

Recommendation 13: *Since quality of the staff is a central factor in the success of the program, we recommend that: (1) center directors advertise as widely and openly as possible in seeking candidates for staff positions, (2) every effort be made to maintain staff vitality, and (3) outposted staff receive the same sabbatical privileges as staff posted at headquarters regardless of source of funds supporting the scientist (pp. 92-94).*

CGIAR PLANNING, EVALUATION, ALLOCATION AND MANAGEMENT

Long Range Planning and Evaluation

Every effort should be made to retain the present informal character of the CGIAR and the activities it supports. These characteristics include: the consultative nature of the CGIAR, membership mainly comprised of donors, the right of each donor to designate how its contribution is to be used, the support of independent research centers and related activities, and minimum bureaucratic structure.

TAC should continue to play a major role in providing the CGIAR with advice about future needs as well as evaluating ongoing activities. TAC's responsibility should include quinquennial reviews, across center analysis of particular topics (stripe analysis), and periodic reassessment of CGIAR priorities.

We also conclude that the CGIAR is a highly dynamic entity. The centers and related activities supported by the CGIAR will continue to mature, national research programs will increase their own capacities and research needs will change. Therefore, the program and procedures of the CGIAR should be reviewed frequently.

Because of the dynamic nature of the CGIAR, we have made specific recommendations only for the next three to five years. Beyond that we present possible criteria to use in making future judgments and recommend a mechanism for periodic evaluation.

The following recommendations provide additional specific mechanisms needed for long range planning and evaluation of the CGIAR.

Recommendation 14: *We recommend that the CGIAR review its overall program and operation every three to five years. The CGIAR should appoint an ad hoc committee to conduct a review of the substantive program of the CGIAR as well as review those policies, procedures, and management mechanisms which require attention. TAC should provide a major input into this long term forward look at the substantive program (pp. 96-98).*

Recommendation 15: *We recommend continuation of the TAC quinquennial reviews for evaluation of scientific quality, scope, and balance of current programs, and to evaluate future plans, including explicit review of center proposals to continue projects of long standing. We also recommend that the TAC give greater emphasis to periodic, across center analysis of particular topics (stripe analysis) (pp. 96-98).*

Mechanism for Budget Planning and Development

The character of the CGIAR and of the centers and related activities, respectively, poses a problem for planning and coordinating financial needs and fund availability. There are several elements in the problem: (1) the annual budgets of centers and related activities are developed with few guidelines and contain projections of variable quality with respect to future programs, directions, and financial needs; (2) a large number of

independent donors who contribute to centers on an annual basis leading to potential funding instability; (3) there is no mechanism to manage the situation when total donor resources fall short of center requests; and (4) integrated program and fiscal analysis is not carried out.

Part of the solution to this problem lies in limiting the number and size of CGIAR supported activities primarily for program rather than financial reasons. Another part of the solution lies in (1) combining program and budget reviews more completely and (2) making more realistic projections so that both centers and donor-members of the CGIAR may be able to plan ahead.

We conclude that annual budgeting and the lack of effective forward planning of budget needs is potentially a serious problem. We further conclude that one way to increase the stability of future funding is to develop a mechanism for improving forward budget planning for centers. Because of the interdisciplinary mode of centers, the need to maintain a sharp focus on the primary mission of the center, and because of potential financial constraints, we conclude that there is a desirable size range for centers. Each center should be requested to propose a desired size (in terms of number of senior scientists and total budget) and then use this as a central element in developing its future plans.

We conclude that biennial budgets, with an additional two year indicative plan which emphasizes staff needs, major proposed program changes and capital requirements, should be prepared by centers. TAC should review the indicative plans and recommend to the CGIAR reasonable program growth patterns for each center. These growth patterns would then become guidelines for future budget development.

In the process of reviewing these biennial budgets and the additional two-year indicative plans, TAC would be in a position to comment on current programs. These conclusions lead to the following recommendations.

Recommendation 16: *We recommend that the concept of a desirable size range for centers be adopted. We further recommend that centers be asked to propose their desired size based on the number of senior scientists translated into financial terms. Until these plans are developed, we recommend that any proposed increase in senior staff numbers that would take centers above the size of the largest existing centers should be closely scrutinized (pp. 86-87 and 98-100).*

Recommendation 17: *We recommend that a biennial budget cycle be adopted for centers and related activities. In addition, a further indicative plan for the two years beyond the biennium should be developed. These budgets and indicative plans to be developed by centers should be consistent with their proposed desired size (pp. 98-100).*

Recommendation 18: *We recommend that the desired size and indicative plan proposals from centers be reviewed by TAC. TAC should make appropriate recommendations to the CGIAR, after the discussion of any proposed adjustments with the centers. The CGIAR approved plans would then form the guidelines for the preparation of the center's next biennial budget. Until this process is in operation, centers should recognize that proposals for budget increases will be reviewed very carefully in the spirit of our recommended period of consolidation (pp. 98-100).*

Mechanism for Budget Allocation

These budgets and indicative plans would greatly enhance the information available to donors about the future financial magnitude of CGIAR needs. Parallel with longer horizons in center planning, we conclude that donors should be encouraged to expand the time horizon of their own commitments by agreeing on several guidelines regarding their own behavior.

It is our judgment that, if forward planning by centers and longer potential obligations by donors are possible, the likelihood of serious annual shortfalls will be minimized. However, the possibility of such shortfalls is not fully eliminated. We therefore conclude, that a standby committee of the CGIAR should be available to advise the group if shortfalls appear imminent.

Recommendation 19: *We recommend that within the framework of the following guidelines, donor autonomy be preserved and that center budgets result from the sum of independent donor decisions. The guidelines are: (1) donors be encouraged to increase the flexibility of their pledges, (2) donors be encouraged to continue support for a reasonable period of time to allow centers to produce research results, (3) donors be encouraged to precede any substantial reduction in support by two years' notice, (4) that donors agree to cooperate to assure that no center or other CGIAR supported activity receives greater support than its budget request, including supplemental requests, and (5) donor(s) of last resort fund a center that is seriously underfunded, but if that situation continues for two or three years the future of the center should be reviewed by the CGIAR (pp. 100-101).*

Recommendation 20: *We recommend that a standby committee of the CGIAR be authorized. Its membership should include the chairman of the TAC and the executive secretary. We suggest the committee stand ready to advise on how the Group should deal with significant shortfalls in funding. The committee could also be activated by the CGIAR or the Chairman of the CGIAR for advice should other policy issues or circumstances arise (pp. 101-102).*

Budget Analysis and Management

Regardless of whether shortfalls occur there needs to be more integrated program and budget analysis of current budget proposals. This should be provided by closer coordination of the TAC and CGIAR Secretariats. An assurance is needed that adequate budget and staff are available to do the job. The independence, integrity and effectiveness of these secretariats are essential to donors in justifying continued support to the CGIAR.

Finally, we comment on the seriousness of the cash flow problem in certain centers. The obvious solution is for donors to make greater efforts to provide their contributions to centers and related activities as early in the fiscal year as possible.

Recommendation 21: *We recommend that steps be taken to ensure closer coordination between the TAC and CGIAR secretariats to enable them to jointly produce integrated program and budget analysis for the CGIAR. Certain additional points of organization and procedure should be agreed upon:*

(1) Adequate staff and financial resources must be provided for the work of each of the secretariats.

(2) *The co-sponsors should report to the Group at its July meeting on the budgets of the secretariats for the coming year. If sufficient resources cannot be provided by them, donors should be asked to make additional funds available.*

(3) *Each secretariat should recognize that it reports only to the Group, through its respective chairman.*

We further recommend that the co-sponsors report to the Group at the forthcoming meeting (October 1976) whether they foresee any difficulty in meeting these considerations (pp. 102-103).

Recommendation 22: *We recommend that donors be strongly encouraged to provide their pledged funds as early in the fiscal year as possible. Further, we recommend that the CGIAR Secretariat provide donors and centers with a time schedule of center budgetary needs and availability of donors' funds. If these two mechanisms do not solve the cash flow problem, we recommend that the World Bank explore alternative solutions (pp. 103-104).*

INTRODUCTION

The Consultative Group on International Agricultural Research (CGIAR) was founded in 1971 partly to facilitate adequate funding for the International Agricultural Research Centers launched earlier by the Rockefeller and Ford Foundations and partly to consider establishing additional and/or other international agricultural research activities.

There were four International Centers in existence in 1971. The new CGIAR soon decided to add five more; by 1976 there were a total of nine such centers although all are not yet operating. In addition, certain other activities, e.g., WARDA, CARIS, were supported by the CGIAR. All of these organizations are at various stages of maturity in terms of staff, physical facilities, and program development. In addition to growth in the number of CGIAR supported activities, the number of members of the CGIAR doubled in the same period.

Those developments led to rapidly increasing financial requirements and to a question of how long the increasing financial needs could continue to be fully funded. If they could not be, then some rational means of establishing priorities among current and potential research activities (or at least of allocating insufficient funds among established activities) would have to be devised.

Because the CGIAR is five years old; because it has grown at a rapid rate, both monetarily and organizationally, and because it has increased in complexity and has been called upon to contribute more support toward the solution of the food problem, it seemed appropriate to re-examine its scope and direction.

Thus in October 1975, the CGIAR began a review of its future role by establishing a Review Committee which in turn selected a four person study team to assist in this analysis. The Review Committee adopted the following Terms of Reference. This document is formulated around issues raised in the Terms of Reference.

Final Terms of Reference 1/

I. The committee will review available projections until the year 2000 A.D. of probable production of major food commodities, and trends in economic demand and in nutritional needs, especially in the areas most severely pressed. It will also review existing expert opinion as to rates of yield and production increase that are considered feasible over the next 10 years as a result of research and its application.

1/ Approved by the CGIAR Review Committee, March 18, 1976.

II. The Committee will review available information on the effort devoted to, and the objectives and promise of, major research programs already in progress that are relevant to the principal food crops, animal products, and related farming systems.

III. In the light of information obtained from I and II the Committee will review existing expert opinion as to needs for expanded applied and basic research relevant to the principal food crops, animal products and related farming systems noting particularly those areas of research that could appropriately be undertaken either by international centers or through other activities cooperatively financed by members of the CGIAR.

IV. Having regard to the existing and prospective state of development of national research and extension efforts in the LDCs, the Committee will suggest appropriate boundaries for the responsibilities of the Centers with respect to their own research programs, collaborative research with the developed countries, training, strengthening national research programs, facilitating the effective transfer of technology to beneficiary countries and its use there.

V. The Committee will suggest boundaries for the activities and responsibilities of the CGIAR itself with respect to the international Centers, other forms of CGIAR international agricultural research programs, national research and production programs and/or other activities in which various groupings of its members may have a common interest.

VI. The Committee will examine the statements of priorities recommended by the TAC, and consider whether it wishes to suggest any change in those priorities for CGIAR activities. It may, in addition, suggest special priorities and/or an overall size for the Centers, individually or collectively, for the next five years.

VII. The Committee will estimate the level of financing required by the international Centers and other CGIAR-supported activities over the next five years based on different assumptions with respect to programs. It will seek to ascertain the likelihood of availability of funds for the system as a whole under those program assumptions. If a shortfall seems likely it will recommend mechanisms, including means of establishing priorities among programs, for bringing resources and program needs into balance, should that become necessary.

VIII. The Committee will consider what measures may be necessary and practicable to insure that manpower and money devoted

to the CGIAR's international research are efficiently used. It may also suggest ways in which the procedures of the CGIAR, the TAC, and the Centers may need to be modified either individually or in relation to each other.

Scope of the Report

The report focuses primarily on issues of future possible scopes, mechanisms, and magnitudes of the CGIAR and of its activities.

As a necessary background for future analysis, Part A presents information against which the issues discussed in Part B can be considered. This background includes: (1) a summary review of projected world food needs, (2) a review of the potential contribution of research in meeting those needs, (3) a review of the character and nature of agricultural research, (4) a description of current research efforts addressing the food problem especially in developing countries, and (5) a review of the evolution of the CGIAR and of its current activities. Thus Part A attempts to set in perspective the current situation of the CGIAR.

The report then considers three major issues in Part B. These issues are: (1) the future scope and boundaries of the CGIAR including some indication of the cost of different options; (2) the scope and boundaries of individual CGIAR activities (centers, etc.); and (3) mechanisms for planning, evaluation, allocation, and management.

It is also appropriate to state what the report does not attempt. It is not a review of the scientific content and quality of current CGIAR activities, nor does it attempt to make judgments about future program emphases. It is not a full-scale independent review of the world food situation nor a review of all research devoted to agricultural production. Finally, it is not an evaluation of the effective scope of national research programs.

More information about the work sponsored by the CGIAR (the purpose, function, and operation) can be obtained in International Research in Agriculture published by the Consultative Group on International Agricultural Research.

Method of Approach

Donor-members of the CGIAR, center directors and board chairmen of centers were interviewed on the range of issues contained in the Terms of Reference. As a prelude to those interviews, two documents

labeled Staff Paper 2, "Questions for CGIAR Members" and Staff Paper 3, "Questions for Centers and Their Boards" were prepared. These interviews included visits to the eight existing centers and some of the other CGIAR supported operations. The opinion of 26 donors was sought. In addition, several other people knowledgeable about the CGIAR were interviewed. These interviews were conducted in most cases by at least two members of the Study Team selected by the Review Committee.

A paper on world food needs was commissioned. The paper prepared by Nathan Koffsky titled "World Food Needs: Food Gaps and Performance" is included as the Annex. It has formed the basis for Chapter I.

Many documents related to the issues addressed in this report, including the TAC priorities paper2/, were extensively reviewed.

2/ "Priorities for international support to Agricultural Research in developing countries," TAC Secretariat, FAO, Rome 1976.

PART A. CONTEXT AND BACKGROUND OF ISSUES

I. THE WORLD FOOD PROBLEM TO 1985 AND 2000 A.D.

The CGIAR grew out of concern about the world food problem, especially as it affects people in the less developed, low income countries. Nathan M. Koffsky was commissioned to summarize the current magnitude and character of the problem in "World Food Needs: Food Gaps and Performance"; a copy is annexed to this report. 1/ This chapter is based primarily on the Koffsky paper.

Despite the gains in productivity that have been made in recent years, the problem is growing, and with expected increases in population levels, it seems likely to grow still more. If recent production and yield trends were to continue, the deficit in cereal production in Asia, Africa, and much of Latin America is likely to rise from about 17 million metric tons in 1969-71 to between 65 million and 83 million tons in 1985-86; and it might grow by another 30 to 35 million tons by 2000 A.D. Similar increases in deficits are likely in root and tuber crops, and grain legumes.

Those projections alone are sufficient to call for intensified efforts to increase farm production.

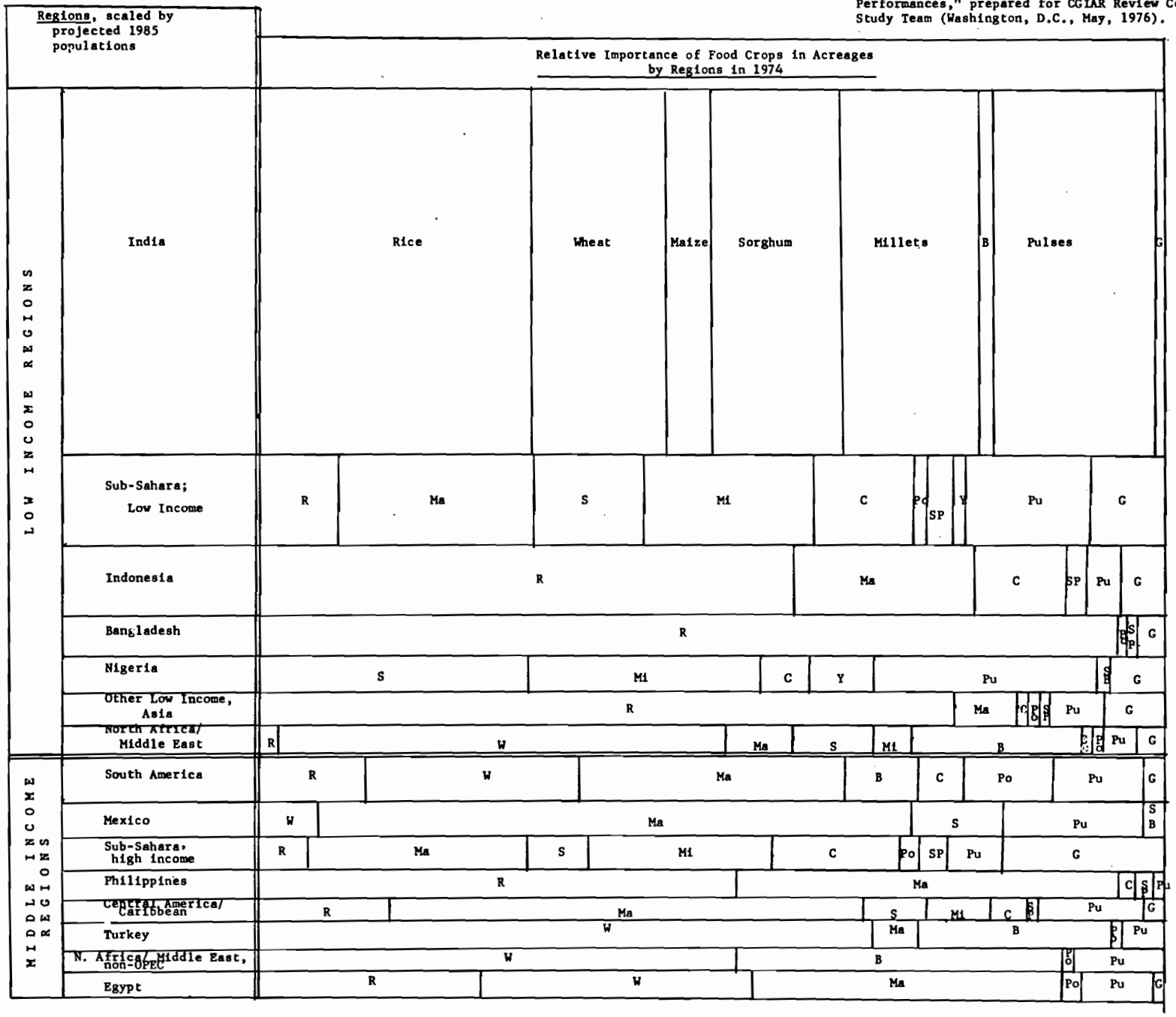
Global and aggregate figures similar to those just cited are insufficient as a guide to action. To formulate guidelines, a clearer picture of current production, potential increases in production, specific food commodities needs, by countries or geographically associated groups of countries are needed.

Such a breakdown is depicted in visual terms in Chart I-1 on the next page which portrays in juxtaposition (a) the percentage of cropland devoted to each major crop in 1974, by country or groups of countries; and (b) the projected 1985 population of each country or group of countries. The width of each vertical band is proportional to the percentage of cropland devoted to each crop. The width of each horizontal band is proportional to the projected 1985 population of each country or group of countries. As a consequence, the chart shows the location in which each crop is important, its importance in terms of the number of people affected, and its relative importance among major crops in each region.

1/ Some of the studies used by Koffsky in preparing his paper were conducted by the U.S. Department of Agriculture, the Food and Agriculture Organization of the U.N., and the International Food Policy Research Institute.

Chart I-1

Source: Nathan M. Koffsky, "World Food Needs; Food Gaps and Performances," prepared for CGIAR Review Committee Study Team (Washington, D.C., May, 1976).



The coverage of countries in Chart I-1 is limited in three ways. First, only low income countries with a GNP per capita of under $200 and middle income countries with a GNP per capita of $200 to $400 are listed. Second, it is further limited to those regions faced with food deficits and foreign exchange constraints, thereby eliminating OPEC countries and a few others like Korea, Taiwan, Malaysia, Thailand, and Pakistan, that are predicted to be food exporters by 1985. Third, only countries having market economies are included. The Peoples Republic of China and other Asian centrally planned economies are, therefore, omitted. Even with these omissions, the chart includes the countries about which the CGIAR has been, and needs to be most concerned. For example, by 1985 it is projected that 40 percent of all the people in the low and middle income countries will be in India.

Current acreages in major food crops in India consist of 30 percent in rice, 15 percent in wheat, 5 percent in maize, 14 percent in sorghum, 15 percent in millet, 2 percent in barley, 18 percent in pulses and 1 percent in groundnuts. No root or tuber crop occupies as much as 1 percent of India's acreage in major food crops. In contrast, in low income countries in sub-Saharan Africa, 53 percent of the acreage is in maize, sorghum or millet, and 11 percent is in cassava (see Table I-1).

Both Chart I-1 and Table I-1 reflect the predominant importance of cereals in the diets of the low and middle income countries covered in Koffsky's review; neither refers to animal products as a foodstuff in those countries. Those, however, are covered in a table in Koffsky's paper, which is reproduced as Table I-2.

In Table I-2 it will be noted that the percentage of calories derived from meat and eggs is particularly low in all Asian, low income countries and in Nigeria. A relatively greater consumption of milk and milk products in the Indian subcontinent and Nigeria slightly increases this percentage.

The prospects for meeting the food gaps by 1985 or 2000 A.D. are not bright. Those projections assume that production trends of the recent past of 2 percent to 3 percent per year will continue. Those rates are similar to rates achieved in developed countries. It has been estimated that to close the gap by the year 2000 would require maintaining a growth rate of 4 percent to 4.5 percent, a rate that has never been achieved in the past, except for a brief period, in South Korea. 1/

Current information suggests that substantial increases are most likely in the yields of maize, sorghum, millets, and cassava 2/ in the near future if research in these areas is continued and perhaps

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1/ "Meeting Food Needs in the Developing World: The Location and Magnitude of the Task in the Next Decade," Research Report No. 1, International Food Policy Research Institute (Washington, D.C., February, 1976).

2/ Cassava also has propagation problems, but its use is largely restricted to two major continents, South America and Africa.

Table I-1

Percentages of Total Food Crop Acres, by Major Crops

Country Grouping	Cereals						Roots and Tubers				Grain Legumes		
	Rice	Wheat	Maize	Sorghum	Millet	Barley	Cassava	Potatoes	Sweet Potatoes	Yams	Pulses	Soy Beans	Groundnuts
LOW INCOME:													
India	30	15	5	14	15	2					18		1
Sub-Sahara Africa	9		22	12	19		11	1	3	1	14		8
Indonesia	59		20				10		2		4		5
Bangladesh	95							1	1		3		
Nigeria				30	26		5			7	24	1	6
Other Asian	77		7				1	1	1		6		7
N. Africa/Middle East (non-OPEC)	2	50	7	9	4	19	1	1			4		3
MIDDLE INCOME:													
South America	12	24	29			8	5	10			10		2
Mexico		7	65	10							16	2	
Sub-Sahara Africa	6		24	7	20		14	2	3		6		18
Philippines	53		42				2		2		1		
Central America/ Caribbean	15		52	7	7		4		1		12		2
Turkey		68	5			21		1			5		
North Africa/Middle East (non-OPEC)		53				36		1			10		
Egypt	25	30	34					2			8		1

Source: Derived from Nathan M. Koffsky, "World Food Needs: Food Gaps and Performance," prepared for the CGIAR Review Committee Study Team (Washington, D.C., May, 1976).

Table I-2

Sources of Calories Consumed Per Capita[1/] by IFPRI Country Categories

(Percent of Total Consumed)

Country Country/Grouping	Total per capita Calories/per day	Cereals %	Starchy Foods %	Pulses, Nuts, Seeds %	Sugar %	Vegetables %	Fruit %	Meat %	Eggs %	Milk %	Fish %	Oils and Fats %
Food Deficit Low Income												
India	1964	64.4	1.5	10.3	10.3	1.4	1.4	.3	.1	4.0	.2	5.8
Bangladesh	1995	70.9	.9	2.9	8.3	1.4	1.3	.8	.1	6.9	.6	5.9
Indonesia	1760	60.4	19.2	6.9	4.1	.7	1.0	1.1	.2	.1	1.1	4.8
Other Asia	2066	72.7	1.8	6.3	4.8	1.3	1.3	1.3	.3	2.2	1.2	6.3
NA/ME Non-OPEC Low	2071	65.2	9.9	8.9	4.2	1.0	2.0	4.0	.1	4.9	.2	4.6
Nigeria	2166	51.5	30.2	7.1	.8	.4	.6	1.4	.1	.7	.3	6.8
Sub Sahara Low	2133	53.8	22.6	10.0	2.6	.6	.8	3.5	.2	1.7	.5	3.6
Food Deficit Middle Income												
Philippines	1911	62.7	5.6	2.8	9.5	.8	3.8	5.1	.5	1.1	2.7	4.7
Egypt	2639	69.6	1.0	3.1	8.1	2.7	3.3	2.3	.2	2.8	.3	6.6
Turkey	2769	61.9	2.8	5.0	5.8	2.0	5.8	2.7	.3	3.9	.2	9.4
NA/ME Non-OPEC High	2248	60.0	.9	3.6	10.6	1.5	4.1	3.4	.4	3.4	.4	11.6
Sub Sahara High	2208	47.1	30.5	6.3	4.0	.6	1.0	2.6	.1	1.3	1.1	5.3
Mexico	2624	52.0	1.5	8.6	16.0	.3	3.7	5.3	.6	3.7	.2	7.7
Other MA/Carit.	2156	46.9	8.7	6.1	15.8	.8	3.0	4.6	1.2	4.6	.7	7.2
Ecuador	1848	31.3	15.3	7.0	16.0	1.6	6.1	7.7	.4	6.4	.5	7.2
Other Latin America	2302	40.5	12.5	2.7	16.2	1.1	2.6	8.6	.5	6.0	.8	7.6
Food Deficit High Income												
Asia Group High	2329	69.5	7.2	3.3	5.0	1.8	1.6	4.5	.4	.8	1.6	3.8
NA/ME OPEC	2007	63.6	1.7	2.6	11.8	1.2	4.1	3.3	.2	3.3	.1	7.8
Venezuela	2367	37.6	13.4	3.7	15.4	.4	2.0	9.1	.8	6.4	1.6	9.1
Food Exporters												
Pakistan	1995	70.9	.9	2.9	8.3	1.4	1.3	.8	.1	6.9	.6	5.9
Thailand	2226	72.1	3.0	5.8	5.3	.9	3.3	3.7	.7	.8	2.2	1.9
Argentina	2885	34.6	6.2	.8	13.1	1.0	3.0	21.3	.8	7.1	.4	11.3
Brazil	2541	33.9	16.1	12.2	15.8	.4	1.9	8.0	.7	5.3	.5	5.1

1/ Computed from Food Balance Sheets 1964-66 FAO, Rome 1971

expanded. Potato yields can be increased, and the range of climates within which they can be grown extended, but due to dependence on vegetative propagation and quarantine restrictions, the rate at which aggregate potato production can increase will be much slower than in the case of cereals.

The food situation will be most severe in the coming decades in low income countries with foreign exchange constraints. It will be less severe in countries that also face food deficits and foreign exchange constraints but are somewhat better off economically. 1/ Domestic food deficits alone need not mean undernourishment if, through international trade, a country can afford to import food. However, there must be enough food produced in the aggregate if global food needs are to be met.

Koffsky's conclusions about global needs have implications for total research priorities. While the present relative importance of different food crops and their geographic distribution are important factors to be considered in research planning, they should not be the sole criterion used to decide which activities the CGIAR should support. Many additional factors should be considered including: use of particular crops in farming systems, other agencies' research programs, and comparative advantage of national research programs versus international research programs. A number of these issues are discussed in subsequent sections of this report.

Koffsky's findings and implications for research: 2/

1. There is a clear case for urgent attention to the needs of the low income countries (i.e., GNP per capita less than $200) where large food shortfalls threaten over the next decade and beyond. Most importantly, these include India, Bangladesh, Indonesia (probably), Nigeria and most other low income sub-Sahara Africa countries. This group also contains most of the malnourished people in the developing world. Food crop yields are generally low and performance in improving them is poor. This is especially a matter of concern in Asian countries where additional cultivable land is a constraint.

2. Next are those countries, somewhat better off economically and in food production, but which also face substantial food deficits and financial constraints to purchase needed food supplies. These include the rest of the sub-Saharan countries, the non-OPEC North Africa/Middle East countries, the Mid-America/Caribbean group (except Mexico) and the Andean countries of South America, especially Peru and Bolivia.

1/ National averages conceal the fact that substantial differences exist between various segments of the economy.

2/ Koffsky, "World Food Needs."

3. This does not mean that others, where improved crop yields are a major determinant of higher incomes and levels of living should be denied attention. But the major focus should be directed to the groups above if the food problem in developing countries is to be resolved.

4. While attention should continue directed toward improving yields of the major cereals -- rice, wheat and maize -- there is need also for emphasis on millets and sorghum which are associated with the dry land cultivation prevalent in many food deficit countries. The same is true for root crops and for pulses and groundnuts.

5. In Asia, the primary need continues to be improvement of rice yields, the major food. Performance in this respect appears to be more or less adequate only in Pakistan and Indonesia. In India, additionally, poor performance in sorghum, millets and pulses also contributes substantially to the food problem. In Indonesia, where cassava is important, yields are on a declining trend. The situation for maize and groundnuts is generally unsatisfactory throughout the region.

6. In sub-Sahara Africa, yield performance of the major cereals -- maize, millets and sorghum -- is poor, particularly for the latter two where yields are declining. Root crops -- cassava, yams and sweet potatoes -- which rank with cereals as a major food source in much of the region, are having difficulty in maintaining historical yield levels. Yields of pulses and groundnuts are on a declining trend.

7. In North Africa/Middle East, the major problems in food crops remain wheat and barley, although in the low income countries of Sudan, they involve sorghum, cassava and pulses and, in Afghanistan, millets as well as wheat.

8. In Latin America, where maize is the dominant food, the main problem countries are in the Mid-America/Caribbean area (except Mexico) and in Bolivia and Peru. Maize yields in the former group have not changed much in the past and have risen only slowly in the latter two countries. Cassava and sweet potatoes are important in Haiti (a low income country), but yields show no significant change historically. In Bolivia and Peru, yields of wheat are low and declining in the latter country. Yields of potatoes in Peru are low and also show no tendancy to improve. In most of Latin America, production of pulses lags behind population growth.

9. It should be noted that there is an immediate and urgent need to improve food production in low income food deficit countries. This places added emphasis on accelerating and exploiting research on those commodities where the potential exists to make a significant impact in the next 5 to 10 years.

10. At the same time, it is recognized that there are other constraints -- inappropriate food policies, lack of incentives, inadequate institutions and management, lack of inputs, etc. -- which impede the adoption of available research and technology by the ultimate cultivator. To narrow this gap, more intensive research is needed to identify and to help overcome such constraints.

II. NECESSARY AND SUFFICIENT CONDITIONS FOR EXPANDING FOOD OUTPUT

The food problem in the less economically developed countries is severe, and is likely to become more so. The activities supported by the CGIAR are intended to help alleviate that problem. In order to identify those activities all efforts that could increase food production should be surveyed before decisions about which activities the CGIAR should support are made.

There are two ways in which agricultural production can be increased: 1) expand the area under cultivation, 2) increase production per hectare per unit of time.

Both approaches to increasing production are constrained by natural resources: by the nature of the soil, by topography and altitude, by moisture availability and ranges of temperatures. In both cases, sustained and increased productivity depend on protecting and improving the character of the soil. The soil should not be depleted to achieve quick increases in productivity, instead long-run and increasing productivity should be sought.

Again, in both instances, increased production requires investment. To expand acreage, land may have to be cleared, but in addition in many cases irrigation and/or drainage may be needed. In agricultural development, increasing production per hectare per unit of time requires investments of many different forms. Among those, investment in research is essential, but it is not the only approach.

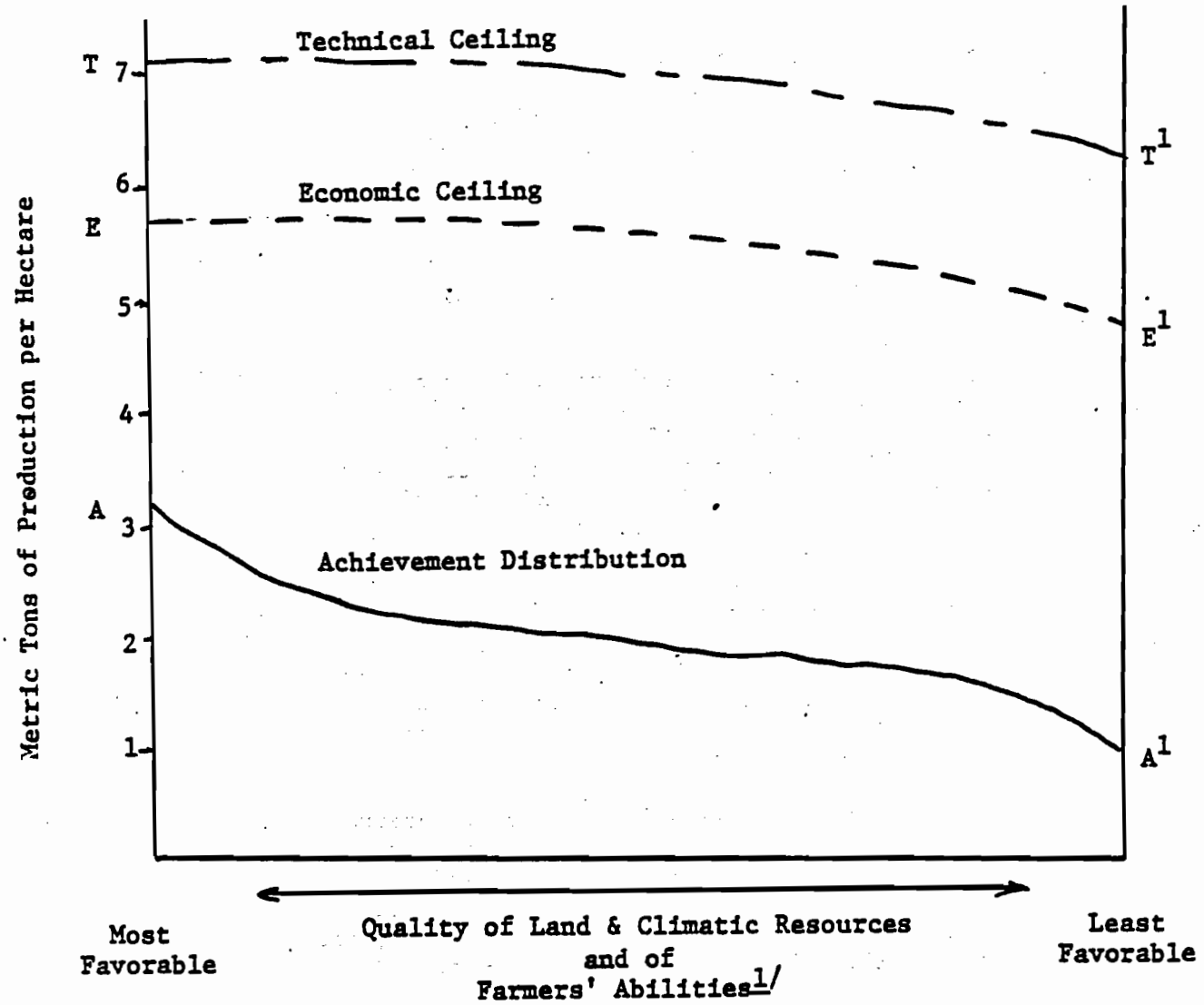
In order to better understand the role of research in this process, we review many conditions that must be met to achieve agricultural growth. Key factors that influence the necessary and sufficient conditions for agricultural growth are: technical ceilings, economic ceilings, achievement distributions, and the specific measures that affect them. Another key factor is the "theory of induced innovation."

Technical Ceilings, Economic Ceilings, and Achievement Distributions

A technical ceiling is the maximum physical production that can be achieved per unit area of land using the most productive set of technologies and services available, given the existing land quality. The highest technical ceiling is achieved on maximum yield plots at experiment stations, including those of the International Centers. It is represented by line $T\ T^1$ in Chart II-I on the next page. The fact that the technical ceiling drifts lower toward the right in the chart reflects what happens to yields when the same technologies are applied on progressively less productive land.

Corresponding to each technical ceiling is an economic ceiling, which represents maximum farm output possible with perfect information and astute economic sense. The economic ceiling is always considerably

Chart II-I



below the technical ceiling because farmers stop applying purchased inputs when marginal cost equals marginal returns, even though additional inputs could increase physical production.

1/ Only differences in land quality enter into the downward drift toward the right of the technical ceiling in Chart II-I. Two factors are responsible for the downward trend toward the right of achievement distribution. One is land quality. The other is differences in the abilities of farmers. Some of those differences can be removed by various types of education and training, but even with equal opportunities, significant differences in farmers' abilities always persist.

The achievement distribution represents the actual achievement of farmers. It always lies considerably below the economic ceiling because of imperfect information, aversion to risk and uncertainty, habit, and imprecise economic decision making. Achievement distributions rise close to the economic ceiling under economically stable conditions with few purchased inputs, in an agricultural system that is technologically stagnant.

Achievement distributions represent the actual accomplishment of farmers; therefore, raising achievement distributions must be the ultimate aim of efforts to raise production.

Conditions for Agricultural Growth

How can the two ceilings and the achievement distribution be raised?

Six activities are essential to keep technical and economic ceilings and achievement distributions moving upward:

(1) Research focused on food production and protection, farm management, and improving the other five activities;

(2) Manufacture or Importation of Farm Inputs: fertilizers, pesticides, tools, implements, etc,;

(3) A Rural Infrastructure of Agri-Support Services: rural roads and local service centers to make information, farm inputs, and production credit readily accessible to farmers; and to move their products to market;

(4) Adequate Production Incentives: primarily favorable price relationships and conditions of land tenure; 1/

1/ Relative prices of inputs and products can affect overall production in two ways. One is as an incentive to use an optimum combination of types and amounts of inputs in producing individual crops. The other is by influencing shifts in the use of land among different crops. Where local conditions allow several crops to compete for the same land areas, the land will be used for the most part, to produce those crops which are currently most profitable. Consequently, when research produces a crop variety and associated cultural practices that make that crop more profitable, the acreage devoted to it is likely to expand at the expense of the area devoted to other crops, which may also be in short supply, and may or may not be nutritionally important.

(5) Land Improvement through irrigation, drainage, land-shaping, and appropriate cultural practices; and

(6) Training Agricultural Technicians to operate all of these essential activities effectively.

Taken together, these six constitute the necessary and sufficient conditions for agricultural growth. All are related to technical and economic ceilings and achievement distributions in various ways.

As depicted in Chart II-2, a technical ceiling can be raised through (1) biological and engineering research and (2) through land improvement.

An economic ceiling can be raised by (1) raising the technical ceiling and (2) increasing the number of farming localities served by markets, and the efficiency of markets for farm products, local outlets for farm supplies and equipment, farm to market roads, favorable price relationships, and favorable tenure relations. 1/

An achievement distribution can be raised by (1) raising the economic ceiling and (2) improving the abilities and skills of farmers and their desire to increase production (e.g., through an efficient extension service).

A substantial gap between an economic ceiling and an achievment distribution is often viewed as a signal that effort be concentrated on extension, rather than research, to raise the achievement distribution.

That would be a major mistake. Instead, it is important to raise the technical ceiling as rapidly as possible, while also raising the economic ceiling. A constantly raising economic ceiling is a powerful incentive to farmers to increase production. As stated earlier, there is always a gap between an economic ceiling and its associated achievement distribution, and that gap is greater in less developed economies. Efforts to raise achievement distributions are important and need to be intensified. However, raising the technical and economic ceiling should be the primary focus.

1/ Parenthetically, the International Centers are proving that they can raise technical ceilings and, to a lesser degree, raise economic ceilings by breeding for responses and resistances that contribute to yield stability. They can find cultural practices that economize on the use of purchased inputs. Meanwhile, center scientists are haunted by lagging achievement distributions and are constantly tempted to give direct attention to them.

Chart II-2

Agricultural Development Activities Appropriate to Raising Technical and Economic Ceilings and Achievement Distributions

Raising the Technical Ceiling is accomplished through:

--Biological and engineering research, and

--Land improvement

Raising the Economic Ceiling can be accomplished by:

--Raising the technical ceiling

--Increasing the number of localities served by, and the efficiency of:

1) Markets for farm products

2) Outlets for farm supplies and equipment

3) Production credit facilities

4) Farm to market roads

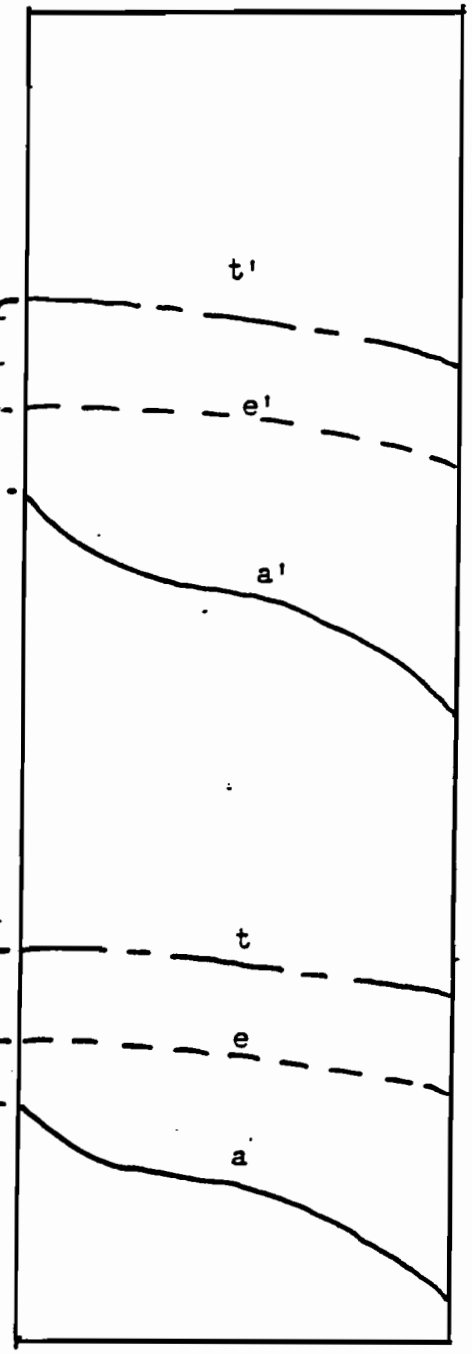
5) Favorable price relationships

6) Favorable tenure relationships

Raising the Achievement Distribution is accomplished:

--Primarily by raising the economic ceiling, but it can be accelerated by:

An efficient extension service and other means of increasing farmers' abilities, skills, and enthusiastic eagerness to increase production



The Theory of Induced Innovation

Technical and economic ceilings, achievement distributions, and the necessary and sufficient conditions for agricultural growth, as, agricultural research are a few of many factors that contribute to growth. The "theory of induced innovation" offers an additional explanation of agricultural growth. 1/

The key points that explain the role of induced innovation in agricultural growth are (1) that the relative abundance or scarcity of different factors of production in any economy induce a search for new technologies that are appropriate to those factor endowments, and (2) that the availability of new technologies induces development of the other innovations (including organizations and services) that are essential to exploit fully these technologies.

The theory implies that the crucial step in agricultural growth is to develop biological and engineering technologies that are appropriate to the resource endowments of each region. Once these technologies are available, they will help induce the development of organizations and services essential to their use.

Although most of the present centers were functioning before that theory was formally presented and verified from historical materials, it is precisely the reasoning that led to the creation of the older centers. Their founders believed that if more highly productive technologies were developed and made available, these technologies would stimulate leaders of national research and production programs to build up the other activities that would take full advantage of the new technologies.

Thus, agricultural research is a necessary but not a sufficient means of meeting the world's food problem. It is the most important contributor to raising technical ceilings. It is one contributor to raising economic ceilings, but many other activities are involved that include improving the rural infrastructure of agri-support services and price and land tenure policies. The influence agricultural research has on achievement distributions is primarily through its effect on technical and economic ceilings and farmer behavior that may be changed by expanding opportunities.

1/ Y. Hayami and V. W. Ruttan, Agricultural Development: An International Perspective (Baltimore: Johns Hopkins University Press).

III. SOME IMPORTANT CHARACTERISTICS OF AGRICULTURAL RESEARCH AND ITS ADMINISTRATIVE NEEDS

Research is one of six interacting activities, referred to in the preceding chapter that in combination can lead to agricultural growth. Each of these six requires distinctive procedures and administration. This chapter is a review of some salient characteristics of agricultural research and presents a brief description of the type of administration it requires.

Some Characteristics of Agricultural Research

Agricultural research focuses on problems that arise in highly interactive and dynamic ecosystems operating within a complex economic and social framework. Crop improvement involves interaction between the genetic composition and developmental processes of plants and other environmental, biological and social factors such as: (1) soils of varying composition, (2) differing patterns of moisture availability, (3) varying insect populations, (4) plant disease organisms, (5) human decisions about crop cultivation, and (6) social customs, such as those governing the division of farm labor. Problems of livestock production involve a similar set of interacting factors.

Need for an Appropriate Research Approach. Relatively simplistic "single-limiting-factor" approaches have limited value in solving these highly dynamic and interactive agricultural problems. These complex problems demand a more comprehensive systems approach to problem solving, employing the combined skills of researchers from many disciplines.

Adopting this more holistic approach to agricultural problems does not lessen the importance of the individual specialist in studying particular components of the system. To maximize their contribution, scientists from varied disciplines must jointly focus on particular problems and exchange scientific ideas. This interdisciplinary approach runs counter to the more traditional disciplinary approach which characterized so much agricultural research effort in the past. Interdisciplinary cooperation has proven to be a successful research approach and a more effective use of manpower.

Time Lags Between Recognition, Application, and Adoption. A common feature of most biological research is the several time lags that are involved. One is the long delay which often occurs between the discovery of a new concept or technology and the recognition of its practical value. The Japanese wheat variety Norin 10 was developed many years before Orville Vogel began using it in experimental trials in the U. S. in 1949. It was several years later when it, in combination with the U. S. variety Brevor, became the progenitor of most of the high-yielding semidwarf wheats that have emerged from CIMMYT's program in Mexico.

A second lag is the period between that recognition and completion of research based on the new concept. Third is the inevitable time lag involved in the adoption of a new technology by farmers.

Uncertainty and Serendipity in Research. Another characteristic of research is the uncertainty which makes it very difficult to predict the outcome of a particular project. The very fact that a problem requires research implies that there are some unknowns in the system. Often a solution is found, partially through luck or a chance discovery. This serendipity has been a feature of many important research developments in agriculture. For example, the discovery of zinc as an important key trace element in soils arose out of the use of galvanized containers in experiments with fertilizer treatments. These are the chance occurrences that make quantum jumps possible in science, but to achieve these, it also requires the right person to recognize the situation and exploit it.

Character of Research Progress and Expectations. Agricultural research history suggests that most progress has been cumulative and incremental, eventually leading to a more complete understanding and a gradual improvement in technology. Only occasionally does research progress by quantum jumps or breakthroughs, thereby resulting in the emergence of a new concept, genotype, or technique, which in turn creates new opportunities for further research. The publicity from this sort of rare occurrence can be a mixed blessing. It builds up the reputation and credibility of the research organization and makes it easier to attract support. However, it can also lead to undue pressure and sometimes a reaction from donors if similar breakthroughs are not forthcoming at fairly regular intervals. New breakthroughs will occur, but these are not predictable. Meanwhile, most progress in agricultural research will continue to be of the cumulative, incremental type.

Characteristics of a Successful Researcher. Attributes required to be a successful agricultural scientist are varied. Formal training is important, but intelligence, ability, and motivation are equally valuable. Many successful agricultural scientists have moved into agricultural research following rigorous training in a more specialized biological field or from different but related fields such as mathematics, physics, or biochemistry. Such scientists often bring new insights and ways of approaching problems which can be valuable in an interdisciplinary team approach. Above all, agricultural researchers need to be able to bring a conceptual approach to problem solving.

The choice of first rate scientists with these attributes is critical. They represent the most important component of any research program and largely determine its outcome.

A Suitable Research Environment. A productive research environment for the scientific staff requires good leadership, adequate equipment and facilities, independence, opportunities to interact with other scientific colleagues, and adequate rewards and recognition.

Priorities, Planning, Evaluation, and Management

The preceding brief discussion of the character of agricultural research makes it clear that the research enterprise is atypical; it is unlike many other types of agricultural development activities. For that reason, issues relating to priority setting, planning, evaluation, and management of research require additional brief comment.

The process of identifying priorities and translating them into specific goals -- a responsibility of any agricultural research organization -- requires a delicate balance between generality and specificity. Further, that balance is going to be different at each level in a research organization. Clearly, problem-oriented, interdisciplinary agricultural research requires clear choices about the geographic target area and the problems on which to focus. The criteria for these choices should include: (1) geographic importance of different food sources, (2) importance of particular food sources in the diets of target populations, (3) the limitation of agroclimatic conditions, (4) the magnitude and character of ongoing research, (5) the existing state of research knowledge, and (6) some estimate of the impact research might have in raising technical and economic ceilings. Integration of these and other factors to make quantitative priority choices is virtually impossible; and therefore, the choice of priorities must come from subjective judgment about the potential impact that a sustained research effort might have on levels of food output. Thus at the general level (e.g., CGIAR), these priorities need to be specific, constantly evaluated, and continuously emphasized. However, these goals should be generally outlined for the research unit, providing adequate leeway for the research unit to develop an appropriate strategy.

Given that research is interrelated, long term, chancy, and has an unknown specific outcome, the development of a research strategy is a critical element in the success of a research program. That strategy must allow maximum freedom for the researcher and the research institute to decide the best approach and proceed to direct its research activities toward the general goal.

Researchers must be experienced and highly qualified. To maintain their quality, researchers should have the opportunity and encouragement for continuous self-renewal. They must be able to work in a stable environment with maximum opportunity for scientific interchange. They must be provided with excellent equipment, laboratory and field facilities. They must have dynamic and enlightened leaders who constantly keep the goal before them and who have frequent, direct contact with problems under attack. They must have a feeling of personal and resource security that permits maximum sustained effort on a specific problem without bureaucratic interference.

In summary, a successful research strategy is one that involves clearly defined goals, the best possible inputs in the correct combination, and maximum freedom to pursue promising avenues within the general

goal. Therefore, it is inherently difficult to predict outcomes and apply traditional evaluative measures, such as, rates of return or cost-benefit analysis.

The above strategy should be pursued long enough to permit the possibility of substantial progress towards the goal. This time period will vary depending on the nature of the goal. However, once an institution is operating, periodic ex post progress reviews are essential. These reviews should involve internal program evaluation by the researcher and the research team (internal peer review), review by other members of the research institution, periodic external review by knowledgeable people outside of the institute, and review by potential users and donors.

This chapter presented a general description of agricultural research and its management needs. It will be noted that there is a good deal of harmony between what good research requires and what the International Centers now exemplify.

IV. AGRICULTURAL RESEARCH ORGANIZATIONS SERVING DEVELOPING COUNTRIES

The International Agricultural Research Centers sponsored by the CGIAR represent one among many research efforts serving the needs of developing countries. This chapter briefly reviews the kinds of research organizations that are involved, the interrelationships among them, the magnitudes of the resources devoted to them, and some of the problems involved in improving national programs.

Major Components

There are four major types of agricultural research serving the developing countries: national, regional, international research (the centers), and research conducted in developed countries.

National Research. Within developing countries, most agricultural research is supported by public funds (in some cases augmented by direct grants from bilateral and other aid agencies) and is conducted by or under the auspices of ministries or departments of agriculture. A limited amount of research is also conducted by universities and colleges of agriculture, who often have well qualified graduates on their staffs but because of limited facilities and funds some of them contribute little to national research efforts.

Two influences from the past may have inhibited the development of productive national research programs. The heritage of single-crop research institutions focused on export crops, established in colonial times and financed by a tax on exports has probably delayed adequate financing for research on other crops financed out of general revenues. Second, there has been a tendency to scatter research efforts on non-export crops among a large number of small experiment stations, thus failing to achieve a critical mass of high quality staff in particular places.

In an effort to overcome these problems, some countries have created central National Agricultural Research Institutes that group all the main research areas under an umbrella. These institutes have sufficient strength and flexibility for research on specific commodities or problems to be conducted, either within disciplines, or on a multidisciplinary basis. Examples of this approach are the Indian Council of Agricultural Research (ICAR) with its All-India Coordinated Research Programs in particular commodities, the Malaysian Agricultural Research and Development Institute (MARDI) and the quasi-government corporation (EMBRAPA) in Brazil.

In addition to central research organizations, an important task facing any national research effort is to create decentralized programs

that can adequately serve the localized social, economic, and environmental problems without excessive fragmentation and dissipation of scarce resources.

Regional Research. Another component of the research system in the developing world is regional multi-country research programs. These are fairly recent and have developed on a modest scale in Africa, the Middle East, Central America, and Southeast Asia. Some examples of these organizations and the scope of their activities are listed on the next page (Table IV-1).

Among the regional programs, those supported through the Office de la Recherche Scientifique de Technique d'Outre-Mer (ORSTOM), and the Groupement d'Etudes et de Recherches Pour la Developpement de l'Agronomie Tropical (GERDAT) both operating in francophone Africa, are probably the most extensive and well supported. Both organizations have central stations or research institutions supported by a network of secondary research centers distributed through the region. In the case of GERDAT the organization is further subdivided into a number of commodity research institutes with their own substations (e.g., IRAT, Institute de Recherches Agronomiques Tropicals et des Cultures Vivrieres).

The other regional organizations listed obtain funds from host countries, in addition to those received from sources outside the region, e.g., U.K. in the case of East Africa, The Ford Foundation and FAO in the Middle East, U.S.A. for Central America, and France and the CGIAR in the case of WARDA in West Africa.

Agricultural research in regional programs covers the spectrum of research activities. With some exceptions, (e.g., ORSTOM) it is largely mission oriented. Some of it involves longer term investigations that have regional implications.

International Research. The International Agricultural Research Centers (IARCs) constitute a third tier in the research structure of the LDCs.

Most of them are located in developing countries in the low latitude belt around the world and have a strong commodity focus, usually developed within a farming system context. The majority of the International Centers are under the collective sponsorship of the CGIAR. The history and development of this organization and details of the program and support for the centers are reviewed in Chapter V.

Some of the special advantages of the IARCs are their ability to attract a critical mass of talented scientists and provide them with adequate funding and facilities; their independence, flexibility, and interdisciplinary approach to problem solving; their strong focus on issues that are central to the problems of food production in developing countries; and their ability to interact with national and regional research programs through a global network of collaborative research efforts.

Table IV-1

Some Examples of
Regional Research Organizations
Operating in Developing Countries

Organization	Region	Activity
ORSTOM Office de la Recherche Technique d'Outre-Mer	Former French Colonies in West Africa	Basic research agriculture
GERDAT Groupement d'Etudes et de Recherches Pour la Developpement de l'Agronomie Tropical	Former French Colonies in West Africa	Applied research agriculture
WARDA West African Rice Development Association	West African Region	Applied rice research
EAAFRO East African Agriculture and Forestry Research Organization	East Africa (Kenya, Uganda, Tanzania)	Research in agriculture and forestry
EAVRO East African Veterinary Research Organization	East Africa (Kenya, Uganda, Tanzania)	Veterinary research
OAU/STRC Scientific Technical and Research Commission of the Organization of African Unity	--	--
CATIE Centro Agronomico Tropical de Investigacion y Ensenanza	Central America and Caribbean region	Dairy, beef, food cropping and forestry
SEARCA Southeast Asian Reggional Center for Graduate Study and Research in Agriculture	Southeast Asia	Wide range of activities: water resources, food technology, extension, agribusiness, economics, also postgraduate training
ALAD Arid Lands Agricultural Development	North Africa and Near East	Research and development of basic food crops, winter cereals, food legumes, and work on summer cereals, maize millet and sorghum.

Research in Developed Countries. The fourth agricultural research component serving developing countries is research in developed countries conducted by research institutions, universities, and private business firms. That research contributes in a number of ways:

First, it provides the scientific resource base: the accumulation of past research results and fruitful research techniques.

Second, it provides a number of models for research organization. These vary by country of origin and need to be adapted to the needs of developing countries. They do, however, exemplify: (1) effective combinations of central research institutes and branch experiment stations, (2) fundamental and applied research with technology development, (3) cooperation between universities and governmental research agencies, and (4) quickly mounted efforts to solve emerging problems.

Third, in some cases developed country research is aimed directly at current problems in the developing countries. Concern about the world food problem is worldwide and much of the research in developed countries is now being funded to tackle such basic problems as nitrogen-fixation, photosynthetic efficiency, etc. In addition, research organizations in developed countries are willing to study particular problems referred to them from developing countries, witness the several research contracts CIP has made with organizations in developed countries.

Links and Interaction

A major current need is to foster effective links and interaction among the four research components just discussed.

These links may involve joint research projects, pooling and exchange of research materials and results (including broadly based genetic materials), priority setting and program coordination, training, exchange visits, information sharing services, or other kinds of reinforcing activity. The IARCs have a pivotal role to play in this process. They are in continuous contact and collaboration with national programs in the process of carrying on their own research. They are in a position to work together with regional programs. They operate at the interface of research and technology in the developed world and its application to the problems of increasing food production in the developing world.

The mechanism for collaboration in the past has been largely dependent on voluntary cooperation among scientists and organizations sharing common interests and problems. Now, the cooperative regional and national programs of centers(such as CIMMYT, IRRI, IITA, and ICRISAT) are initiating interaction, and coupled with centers' training activities, are making a significant contribution to the strengthening of national research programs.

The UNDP/FAO Regional Research Cooperation Program in the Near East 1/ is another good example of integrated research activities. It involves an integrated approach, covering the majority of food crops of the region, agronomic work, and problems of both irrigated and dry land farming, embracing a total of 22 countries. It involves cooperation between FAO and national programs, and it is serving increasingly as a vehicle for collaboration with IARCs, regional programs (ALAD) and developed country research institutions that are active in the region.

Sources of Funds and the Deployment of Resources for Agricultural Research in Developing Countries

International aid funds have been a major input in the development of many of the agricultural research systems in developing countries over the last 25 years. In the 1950's international aid probably accounted for 40 percent to 50 percent of the total investment in research in developing countries and although that figure has now been reduced, it is still substantial, approximately 20 percent. The support comes from a number of sources. For example, the French government has provided substantial support for research mainly in francophone Africa. International agencies such as FAO/UNDP have been major contributors to the support of research and training. Aid for research has also flowed directly through bilateral government agencies such as the United States Agency for International Development (USAID), the U.K. Ministry for Overseas Development (ODM), the Canadian International Development Agency (CIDA), the International Development Research Centre (IDRC), from international organizations such as the World Bank (IBRD) and the InterAmerican Development Bank (IDB), and from private foundations.

This support for agricultural research in developing countries has taken a number of forms, including direct grants as loans to governments, provision of expatriate technical and scientific staff, and graduate training.

Although the details about the deployment of these funds in developing countries are not available, some impression of the overall pattern of distribution can be inferred from the global picture of the investment in agricultural research presented in Table IV-2 for the period 1951-1974.

These data show that investment in agricultural research has increased at a rapid pace in all regions, although in the last three years the rate has slowed considerably. The share of the investment in agricultural research in the developing countries has increased from approximately 10 percent in the 1950's to 16 percent in 1971, and has remained fairly constant since that time. Within these countries the contribution to agricultural research from the private industrial sector has been

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1/ Project REM-71/293. FAO, Rome 1975.

limited because of the stage of development. In the more basic agriculturally related scientific research, there again the contribution has been limited because of the slow development of research in universities.

Table IV-2

Expenditure on Agricultural Research by Region /1

Region	Total Annual Expenditure in Millions of Constant 1971 U.S. Dollars		
	1951	1971	1974
Western Europe	130	671	733
Eastern Europe & USSR	132	818	861
North America & Oceania	366	1203	1289
Latin America	30	146	170
Africa	41	139	141
Asia	70	610	646
World Total	769	3587	3840

/1 Includes all agricultural and agriculturally related scientific research supported by public and private funds (does not include agricultural extension).

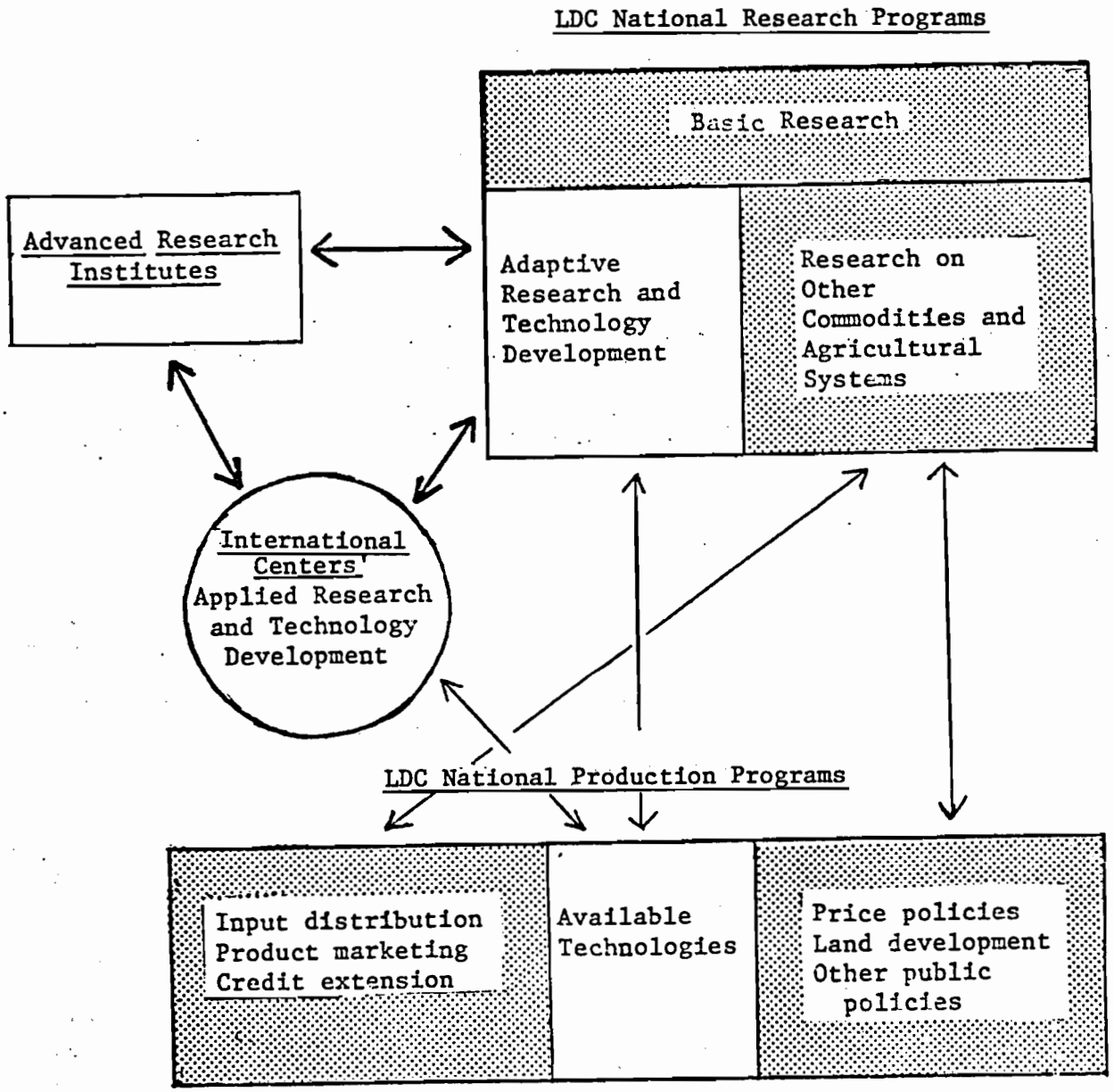
Source: J. K. Boyce and R. E. Evenson. "National and International Agricultural Research and Extension Programs," Agricultural Development Council (New York, 1975).

Despite the widespread efforts since World War II to improve agricultural research and extension programs in the developing world, the investment in these activities is still far short of that achieved in the developed western world.

To assist in the future planning of agricultural research and development in the LDCs, there is an urgent need to obtain more reliable data, on a country by country basis, of the current investment in agricultural research. The data should include the contributions of individual donors, the manner in which these funds are invested in national programs, and the nature and quality of the research they support. The statistical data currently available are not sufficiently reliable to use for this purpose.

International Centers must now operate within a very complex set of circumstances. They must find their place among, and establish optimum cooperative relationships with other international agencies, advanced research institutes, and national research and production systems in LDCs.

These interrelationships are indicated in the following diagram.



In this diagram, the shaded extensions of the box representing national research programs are intended to indicate other responsibilities than just interaction with international technology development. They engage in technology development themselves, not only on crops on which the centers work but on other crops as well. As they mature, they are likely to engage in some basic research, as well.

The shaded extensions of the box national production programs indicate that many factors other than available technologies also affect actual production levels in each country. All of these factors enter into the technology-policy-organizational packages on which national production programs need to be based.

Special Problems in Developing Strong National Agricultural Research Organizations

Given the seriousness of the food problem and the acknowledged importance of research as an essential activity in agricultural development, it is clear that every food deficit, low income country with appreciable agricultural potential needs a strong agricultural research program.

Some agricultural research is now conducted in most of the developing countries, but it varies greatly in both quality and quantity. Some programs are small, others quite substantial. A few are quite effective, many are not. A prime question is: why are these programs not more productive? In large measure it is because of the many severe constraints that must be faced.

One major constraint is the lack of well trained and imaginative research scientists and support staff. Competition for trained scientists is great; many are attracted to more highly paid administrative posts in other ministries. Often seniority considerations in promotion restrict the opportunities of young, talented scientists long enough for them to lose their drive and enthusiasm.

Other constraints relate to the availability and facilities for servicing and repairing complex equipment, and administrative difficulties causing delays in transportation, communication, and in the provision of logistic support for research programs involving growing plants, where timeliness is essential.

Those well trained, young research workers who do remain in agriculture tend to continue working on the more basic research topics that constituted the thrust of their own theses or the thrust of the research institute in which they worked. This is partly due to scientific inertia and also to the desire to obtain scientific recognition by publishing in international journals. Another factor is the reluctance by many scientists in developing countries to participate personally in field research. Many prefer to direct rather than participate, and without talented support staff this is often ineffective. What these countries need most is a strong interdisciplinary team approach to develop appropriate technologies to solve local problems, rather than contributions to the burgeoning growth of journal articles.

Finally, there is the constraint of inadequate funds. Good research can be highly productive, but it does need an adequate and sustained source of funds. Since developing countries need to finance many activities, research must compete with many other urgent demands in the planning and budgeting processes. In the past, agriculture in general, and agricultural research activities in particular, have not had a high priority in the allocation of limited budgetary funds in many developing countries.

Not all of the constraints mentioned here are peculiar to research programs. Some of them are found whenever a new activity designed to further agricultural growth in a developing country is started. They also interact; the demand for a strong national research program is likely to be greatest when the other elements of a successful national production effort (credit, extension, price incentives, etc.) are also in place.

To lessen these constraints, political and administrative leaders must appreciate the importance of research and understand the kinds of research needed and the contingencies necessary to benefit from it. Secondly, it involves many types of changes in personnel policies and administrative procedures, not only within research organizations, but throughout the many governmental departments with which research organizations must deal.

V. THE CGIAR FAMILY OF ACTIVITIES

In earlier chapters we have reviewed:

--the world food problem;

--the variety of activities that are essential to agricultural growth, and within them, the specialized role of agricultural research;

--the characteristics of agricultural research that need to be considered in conducting research (by whatever agency); and

--the many organizations, national, regional, and international, that are currently conducting research for the benefit of developing countries.

The focus of this study is stated in the question: what should the CGIAR do, and how? This final chapter in Part A, therefore, is a review of the history, and present nature of the CGIAR and the major activities it supports, the International Centers. The chapter is divided into two sections. The first is a narrative sketch describing the CGIAR and the existing centers. The second is a fiscal history, discussing the growth of center budgets and the corresponding trend in donor contributions.

Origin and History of the CGIAR: A Narrative Sketch

The Consultative Group on International Agricultural Research was established in 1971. It was an outgrowth of two earlier conferences of donor-agency administrators at Bellagio, who agreed on the need to broaden the base of financial support for four International Centers established earlier by the Rockefeller and Ford Foundations. The mechanism agreed upon was a "consultative group," patterned along the lines of others previously established by the World Bank.

Objectives of the CGIAR

The objectives of the CGIAR, adopted at its first meeting, are worth quoting in full. They are listed on the next page.

It will be noted that "centers," as such, are not mentioned in this statement of CGIAR objectives. Nor is there any restriction to food

Objectives of the CGIAR *

The main objectives of the Consultative Group (assisted as necessary by its Technical Advisory Committee ...) are:

(i) On the basis of a review of existing national, regional and international research activities, to examine the needs of developing countries for special effort in agricultural research at the international and regional levels in critical subject sectors unlikely otherwise to be adequately covered by existing research facilities, and to consider how these needs could be met; 1/

(ii) to attempt to ensure maximum complementarity of international and regional efforts with national efforts in financing and undertaking agricultural research in the future and to encourage full exchange of information among national, regional and international agricultural research centers;

(iii) to review the financial and other requirements of those international and regional research activities which the Group considers of high priority, and to consider the provision of finance for those activities, 2/ taking into account the need to ensure continuity of research over a substantial period;

(iv) to undertake a continuing review of priorities and research networks related to the needs of developing countries, to enable the Group to adjust its support policies to changing needs, and to achieve economy of effort; and

(v) to suggest feasibility studies of specific proposals, to reach mutual agreement on how these studies should be undertaken and financed, and to exchange information on the results.

1/ Research is used in this document in a broad sense to include not only the development and testing of improved production technology, but also training and other activities designed to facilitate and speed effective and widespread use of improved technology.

2/ Final decisions of funding remain a responsibility of each member in connection with specific proposals.

* Consultative Group on International Agricultural Research (AGR 71/3) Annex III.

crops as the proper focus of CGIAR concern. Instead, the objectives speak of "examining the needs of developing countries for special effort(s) in agricultural research at the international and regional levels in critical subject sectors unlikely otherwise to be adequately covered by existing research facilities, and to consider how these needs could be met," and of "reviewing the financial and other requirements of those international and regional research activities which the CGIAR considers of high priority."

In addition, the statement of CGIAR objectives contemplated "undertaking a continuous review of priorities and research networks related to the needs of developing countries, to enable the Group to adjust its support policies to changing needs, and to achieve economy of effort." 1/ It speaks also of attempting "to secure maximum complementarity of international and regional efforts with national efforts in financing and undertaking agricultural research in the future and to encourage full interchange of information among national, regional and international research centers." 2/

In other words, the objectives of the CGIAR are precisely what its name states: a consultative group comprised of representatives from donor-agencies concerned with the broad field of international agricultural research, that consult on meeting the financial needs of selected activities that the CGIAR had jointly agreed to launch and/or financially support, "taking into account the need to ensure continuity of research over a substantial period." 3/

The first footnote to the CGIAR Terms of Reference on the previous page should be particularly noted. It defines research in an unusual way: to include "not only the development and testing of improved production technology, but also training and other activities designed to facilitate and speed effective and widespread use of improved technology." 4/ In adopting that broad definition, the CGIAR recognized the actual nature of the centers then in existence, and their nature and objectives have continued to characterize both the older and the newer centers. It leads, in fact, to one of the questions we shall examine later about the balance in center programs, i.e., to what extent should they concentrate on raising technical and economic ceilings, and to what extent and in what ways is it appropriate for them to seek to raise achievement distributions by other means.

1/ Consultative Group on International Agricultural Research, (AGR 71/3) Annex III.

2/ Ibid.

3/ Ibid.

4/ Ibid.

Influences of Its Origin

Four International Centers predated the formation of the CGIAR. Those were established earlier by the Rockefeller and Ford Foundations. They were operating centers, with a full set of objectives and operating procedures. As the CGIAR later established five new centers organized along the same lines, it is important both to review the nature of the earlier centers and to note some of the problems in management that necessitated changes as a consequence of the shift from foundation to CGIAR sponsorship.

First, IRRI, CIMMYT, CIAT, and IITA had engaged in applied research and technology development, using interdisciplinary teams of scientists backed up by all of the physical facilities needed for first class performance by highly qualified scientists. The emphasis was on solving particular problems, rather than on pushing back the frontiers of knowledge. For two of those centers, the problem was to raise the technical ceiling for the production of particular commodities: rice in the case of IRRI, wheat and maize in the case of CIMMYT. For the other two centers the problem was to try to find more productive ways to use the resource endowments of particular agroclimatic zones: the humid lowland tropics of Central Africa (IITA), and the tropical areas of South America (CIAT).

Second, each of the four centers was administered by its own international board of trustees, but the resources of the sponsoring foundations were available to them. Those resources were financial, and they were also administrative. In the latter case, the foundations, according to their normal administrative procedures, provided a mechanism for (1) adjusting budgets to available funds, (2) encouraging uniform administrative procedures, and (3) technical review by foundation personnel or the consultants they might enlist. When the CGIAR was established, responsibility for fulfilling those functions no longer lay with the foundations. Financing became a function of the CGIAR. The TAC and the CGIAR Secretariat replaced the foundations as far as technical and administrative support were concerned, developing procedures as they went along.

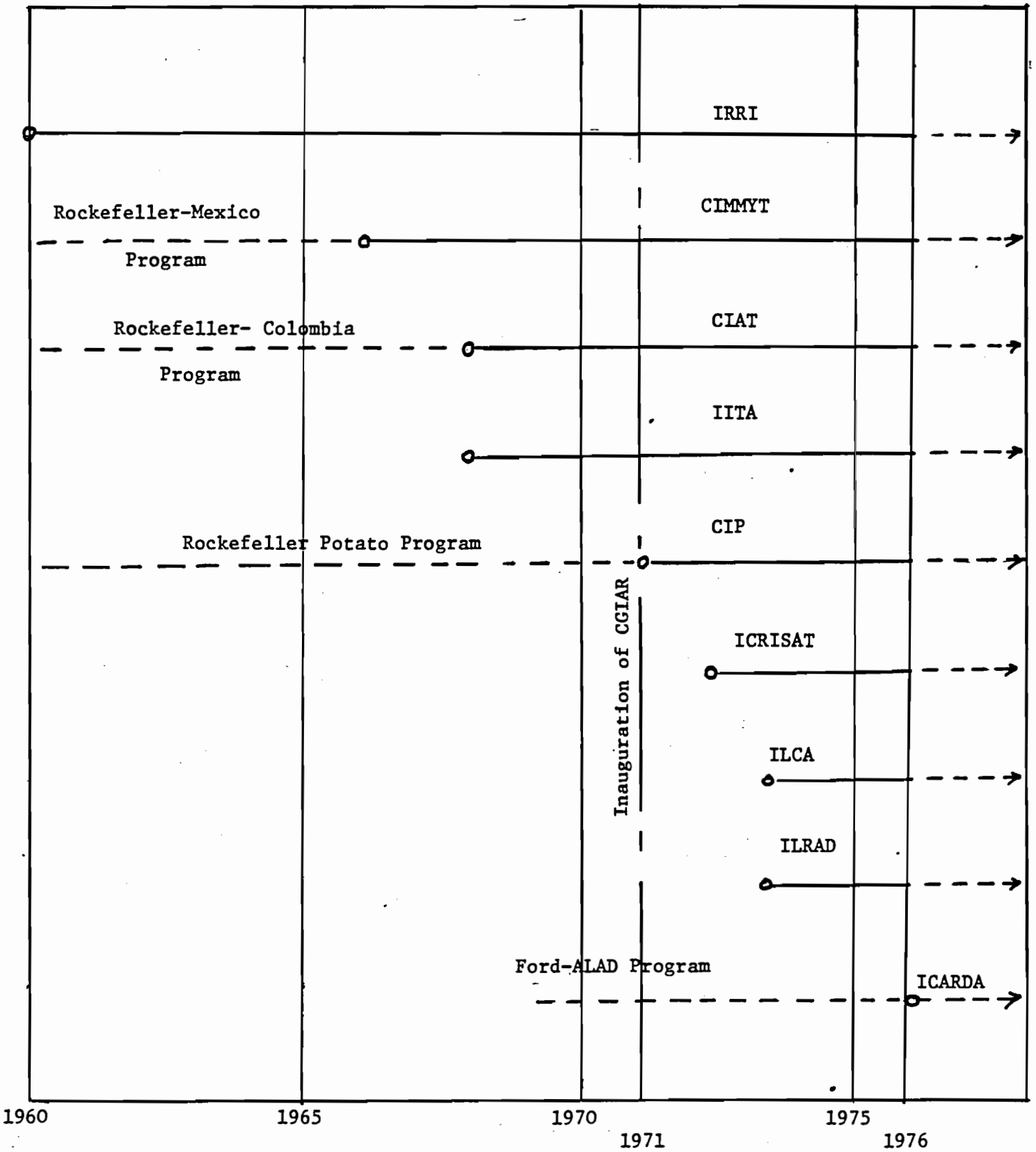
Third, a "major breakthrough mentality" was encouraged by the notable achievements of CIMMYT and IRRI in the late 1960's. It was those accomplishments, to the creators of the CGIAR, that legitimized both expanded support of existing centers and the possible creation of new ones. Despite these accomplishments foundation administrators realized and pointed out, that the problems tackled by CIAT and IITA were unlikely to be solved within a short time and that future advances in rice and wheat were much more likely to be of the cumulative, incremental type, rather than the quantum jumps experienced in the late 1960's.

Present CGIAR Activities

Today there are nine International Centers, including ICARDA which is still in its formative stage. ICARDA is to be built on the base

Chart V-1

Age of International Research Centers



of ALAD, established in 1967 by the Ford Foundation. In addition to the initial four, CIP is an outgrowth and expansion of a previous Rockefeller Foundation program of long standing. Moreover, we have been told by participants at the Bellagio conference that in 1971 initiatives about arid and semi-arid areas and livestock in Africa were considered. Thus, ICRISAT, ILRAD, and ILCA were comtemplated by 1971, although not approved by the TAC, the CGIAR, or launched until later. It should be noted that from the beginning centers could cooperate with national research programs already in existence when centers, through international efforts, were organized.

The other activities that have been supported by the CGIAR within the past five years are diverse in character. WARDA, based in Liberia, is a cooperative program in 13 West African countries dealing with rice research and development. The International Board for Plant Genetic Resources seeks to stimulate and coordinate the collection and exchange of materials of potential interest to plant breeders in developing countries. The Current Agricultural Research Information System (CARIS), managed by FAO, has received financial help through the CGIAR, but the support is currently expected to terminate at the end of 1976.

Including these in the CGIAR family of activities illustrates the willingness of the CGIAR to support international research that is not cast in the normal center mode; this is further exemplified by several proposals that the TAC is currently considering.

Evolution of the Research Centers

Over the past five years, the older centers have remained relatively unchanged in certain respects while undergoing considerable change in others. Each remains highly problem oriented with its emphasis on applied research and technology development, and with an associated training program. Each mounts interdisciplinary teams to tackle specific problems. Each is located in the tropical or low latitude subtropics. Each has, or plans soon to have a well-equipped set of science laboratories, experimental fields, a technical library, documentation center, and training and conference facilities at its headquarters. Each is international in its staff, financing, and management. Each operates under a charter that allows a broader program than is currently being conducted, and that charter can be amended by its board of trustees.

At the same time, there have been significant evolutionary developments in the past five years.

1. Increasingly, each of several centers (IRRI, CIMMYT, and CIP) has moved away from doing most of their research at or near their headquarters and is becoming an organization for widespread coordinated research activities in many countries. In their plant breeding activities, a major technique of the centers is to gather germ plasm from diverse regions, recombine it in many different ways, then test the resulting crosses over a wide range of contrasting environments for yield stability

and pest tolerance, etc. That requires testing in many countries. Moreover, nationally developed varieties are becoming important sources of materials for such international testing.

The core research of ILCA is to be conducted in four regional centers, two in East Africa and two in West Africa. ICRISAT has established one regional research program in West Africa and plans others in East Africa and South America to sample more adequately the semi-arid tropical world.

In addition, IRRI, CIMMYT, and CIP are placing regional teams in a number of different countries, partly to monitor international testing, but also to encourage and aid national in-country training activities and national production programs.

Frequently, one hears it said that "IRRI is at Los Banos" and "CIP is at Lima." Their headquarters are there but their research, and that of other centers is carried on at many places, in many countries.

2. There is a movement toward each of several centers undertaking research on more crops than were initially intended. Thus, CIMMYT now has programs concerning both bread and durum wheats, maize, barley, triticale, and cold-tolerant sorghum. Groundnuts research has been added at ICRISAT. IRRI has recognized that it must deal separately with shallow-water irrigated rice, rainfed "upland" rice and deep-water rice.

3. Farming systems (cropping systems) are receiving increased attention since the way in which a crop, or a variety of crops, fits into a combination of different crops or into sequential cultivation of the same crop vitally affects both its acceptability and its potential contribution to aggregate production.

4. There is an increasing tendency to get involved in a certain amount of basic or fundamental research and to contract for such research. IRRI and CIMMYT had the advantage of being able to draw on an enormous amount of previous research related to the commodities with which they deal. The same is not true for millet, cassava, potatoes, and several other crops grown under tropical conditions. This means some basic research will have to be undertaken by centers. CIP, for example, has been contracting with a number of research agencies in developed countries where the facilities and expert research manpower already exist to undertake basic investigations relevant to its program.

5. Over the past five years, centers have become involved in an increasing number of single-country (or regional) technical assistance projects. Some of these are projects to help develop research programs; others involve assisting national production programs as well.

Such projects are peripheral activities as far as the research purposes of centers are concerned, but they may be helpful in accelerating the strengthening of national research capacities and/or accelerating national increases in food production.

All centers are eager to see national research capacity increase, and they are impatient for their own research results to show up promptly in rising achievement distributions in individual countries. In addition, as centers demonstrate research competence they are courted both by national governments and by donor-agencies interested in more rapid agricultural development in particular countries or groups of countries.

6. Administratively, there has been a change in the method of selecting members of boards of trustees. The older centers' boards have places reserved for members from host countries, foundation representatives, and are otherwise self-perpetuating. On boards of centers more recently established, places are not reserved for foundation representatives and some or all members (in the case of ICARDA and IBPGR) are appointed by the CGIAR.

7. Also administratively, the increases in the number of centers, in the widespread international testing of plant materials, in the number of commodities with which various centers deal, and in the number of single-country technical assistance projects in which centers are involved, have led to questions regarding the jurisdictions of different centers, particularly where they are involved in different capacities in the same countries. Up to now, such problems have been worked out, case by case, by the center directors and boards of trustees of the centers involved.

Current Form and Function

With the formation of the CGIAR, it became necessary to make new provisions for functions previously performed by the foundations. One of those is embodied in the arrangements and procedures for financing centers. Another is the activities of the Technical Advisory Committee (TAC).

Arrangements for Financing Centers. The ways in which the activities sponsored by the CGIAR are financed constitute an adjustment to the policies and legislative constraints of the various donor-members of the CGIAR. Some donors can commit funds more than one year in advance; some cannot. Some can give to the overall programs of international agencies; others can only support particular activities of an international agency, but not its overall program; still others can give only to, or to programs on behalf of, individual developing countries. Some can operate in any of these ways, making grants of each type out of a separate division of their own budgets.

Corresponding to those different situations, centers can accept three types of contributions. One is "unrestricted core" funds that can be used by a center for any part of its program. Another is "restricted core" funds that can be used only for that part of a center's program as it is designated by the donor. The third is "extra-core" (special project) funds that are bilaterally negotiated between a center and donor for special purposes.

Each center, annually in July, presents to the CGIAR a proposed program and budget for the coming calendar year. Individual donor-members of the CGIAR, at that meeting (Centers' Week) give a preliminary indication of how much they are willing to contribute in support of the centers for the coming year.

It would be sheer coincidence if the preliminary financing indications of donor-members matched, even approximately, the budget requests of centers and other activities financed through the CGIAR. At the end of Centers' Week the budgets of some centers may be oversubscribed and others undersubscribed, and the total of all subscriptions may be (and usually is) less than the total needed for all CGIAR supported activities.

Between Centers' Week and the Pledging Meeting, held usually in October, each donor-agency reconsiders what it will do, frequently in consultation with the CGIAR Secretariat, about programs that are under- or oversubscribed. In addition, the CGIAR Secretariat frequently takes the initiative to discuss with different donors helpful ways in which their contributions might be reallocated. Many donors are quite flexible in making such readjustments even though they may still be constrained from pooling their contributions for allocation by the CGIAR Secretariat itself.

Once donors have made their firm subscriptions in the Pledging Meeting, the CGIAR Secretariat recommends allocation of funds that have been made available by those donors who do not specify to which CGIAR activities they are to be applied.

In fact, arranging for the financing of CGIAR activities is a major responsibility of the CGIAR Secretariat. It encourages centers to present their budget figures in a standardized form easily comprehensible by participants in meetings of the CGIAR. It prepares "integrative reports" and comments on the program and budget submissions of all centers and other CGIAR supported activities, suggesting topics that may merit discussion. It helps negotiate shifts in contributions to insure that all budget requests are fully covered. It handles requests of centers for supplementary contributions within each year to meet unforeseen needs.

In addition to its central program and budget, most centers also have several special projects and their associated budgets. The chief substantive difference is that, whereas, the central programs and budgets are considered simultaneously and by all members of the CGIAR, special projects are negotiated separately between a single center and a single donor-agency. They are not reviewed by the CGIAR as a whole although each center now reports to the CGIAR, ex post, all special projects it is initiating.

Special projects are dominantly three types. The most numerous are technical assistance projects to strengthen research and/or production programs in individual countries or groups of countries. The second type is special projects to augment activities within the central program. The third type is special project funding of additional physical facilities and equipment.

The Technical Advisory Committee. Recognizing that representatives of donor-agencies on the CGIAR are not necessarily agricultural scientists, and that they are, in any case, quite busy people, the CGIAR took early steps to establish a Technical Advisory Committee composed of agricultural scientists or research administrators selected for their personal professional capacity and without regard to their organizational affiliations.

The Terms of Reference of the TAC, which are reproduced in full on the next page, delineate three basic tasks: (1) to consider the desirability and technical feasibility of adding new areas of research to those already being supported under the aegis of the CGIAR; (2) to suggest an appropriate organizational mechanism for each type of recommended new research; and (3) periodically to review, from a technical standpoint, the CGIAR sponsored research already underway.

Meeting two or three times a year in five-day sessions, the TAC makes liberal use of task forces and subcommittees, which usually include people from outside the TAC because of the special topic under review, to prepare agenda papers for its consideration. After the TAC has deliberated, its conclusions are formulated by its chairman, with the aid of the Executive Secretary of the TAC Secretariat and submitted to the CGIAR for consideration.

It is understandable, in view of the youth of the CGIAR and of most centers, that most of the attention of the TAC up to now has been devoted to considering new research initiatives for the CGIAR, and appropriate organizational mechanisms for each. That has been a major task in itself, and few of the centers have been mature enough, until recently, for formal evaluative review of ongoing programs to be merited.

Reviews of ongoing programs were begun in 1975, in the form of quinquennial reviews, each conducted by a special team selected for the purpose by the TAC.

In reaching its conclusions about what new types of research should be initiated, the TAC gives first priority to research on basic staple food crops, favoring those that can benefit large numbers of people, but it also considers regional needs. 1/ At any one time it has a large number of possible activities under review. No matter how important a field may be judged to be, it appears that TAC does not recommend it until

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1/ In its February, 1976, meeting, the Chairman, Sir John Crawford, stated: "TAC has always been flexible in its criteria, recognizing that there is a need for a balanced view of regional needs. Poverty and malnutrition exist everywhere, and all resources should not be directed to one area even if the population served was very large, to the complete neglect of other research of vital importance to people elsewhere." (That statement was made in response to a member's query as to why a center is supported just to work on potatoes).

TERMS OF REFERENCE

TECHNICAL ADVISORY COMMITTEE 1/

The TAC will, acting either upon reference from the Consultative Group or on its own initiative:

(i) advise the Consultative Group on the main gaps and priorities in agricultural research related to the problems of the developing countries, both in the technical and socio-economic fields, based on a continuing review of existing national, regional and international research activities;

(ii) recommend to the Consultative Group feasibility studies designed to explore in depth how best to organize and conduct agricultural research on priority problems, particularly those calling for international or regional efforts;

(iii) examine the results of these or other feasibility studies and present its views and recommendations for action for the guidance of the Consultative Group;

(iv) advise the Consultative Group on the effectiveness of specific existing international research programmes; and

(v) in other ways encourage the creation of an international network of research institutions and the effective interchange of information among them.

These Terms of Reference may be amended from time to time by the Consultative Group.

1/ CGIAR, (AGR 71/3) Annex III.

it is satisfied (1) that the kind of organizational arrangements for conducting research are the most effective and (2) that existing research in that field is inadequate.

This means that its priorities are basically time priorities. Research efforts that need to be put forth now because of their intrinsic importance and because the appropriate research mechanisms are clear are given a higher order of priority. Thus, for a field of research to be ascribed a lower order of priority by TAC does not necessarily mean that it is considered intrinsically less important.

The TAC has stated that it does not contemplate proposing any additional centers in the near future, but maintains the prerogative to suggest additional areas of research using other organizational mechanisms, or to add new programs to existing centers.

Fiscal History of the CGIAR Family of Activities

In addition to reviewing the narrative history, it is instructive to review briefly the fiscal developments of the CGIAR for the period 1972-1977. This six-year period has seen rapid growth in center budget requests which have been matched by growth in the number of donors and their contributions. The character of the increases in budgetary expenditures of CGIAR supported activities is treated first. It is followed by a review of donor sources.

Growth of Center Expenditures: 1972-1977

Table V-1 displays total expenditures of CGIAR activities from 1972 through 1976. It also displays requested budget levels for 1977. Including special projects, annual expenditures in the five year period have risen from 22 million dollars to 84 million dollars. To complete the picture of CGIAR costs, it is necessary to identify the costs of the two secretariats serving the CGIAR. These costs were 550 thousand dollars in 1974, 750 thousand dollars in 1975, and one million dollars in 1976. 1/

Part A of Table V-1 shows the growth in budgetary cost for each CGIAR supported activity. The same figures are graphically shown in Chart V-2. Chart V-2 clearly shows the rapid rate of budget increase in all centers over the past three years. All rates of increase have been about the same except for CIMMYT (1974-76) and ILCA (1975-77).

1/ Source: CGIAR Secretariat. These costs include quinquennial review expenditures.

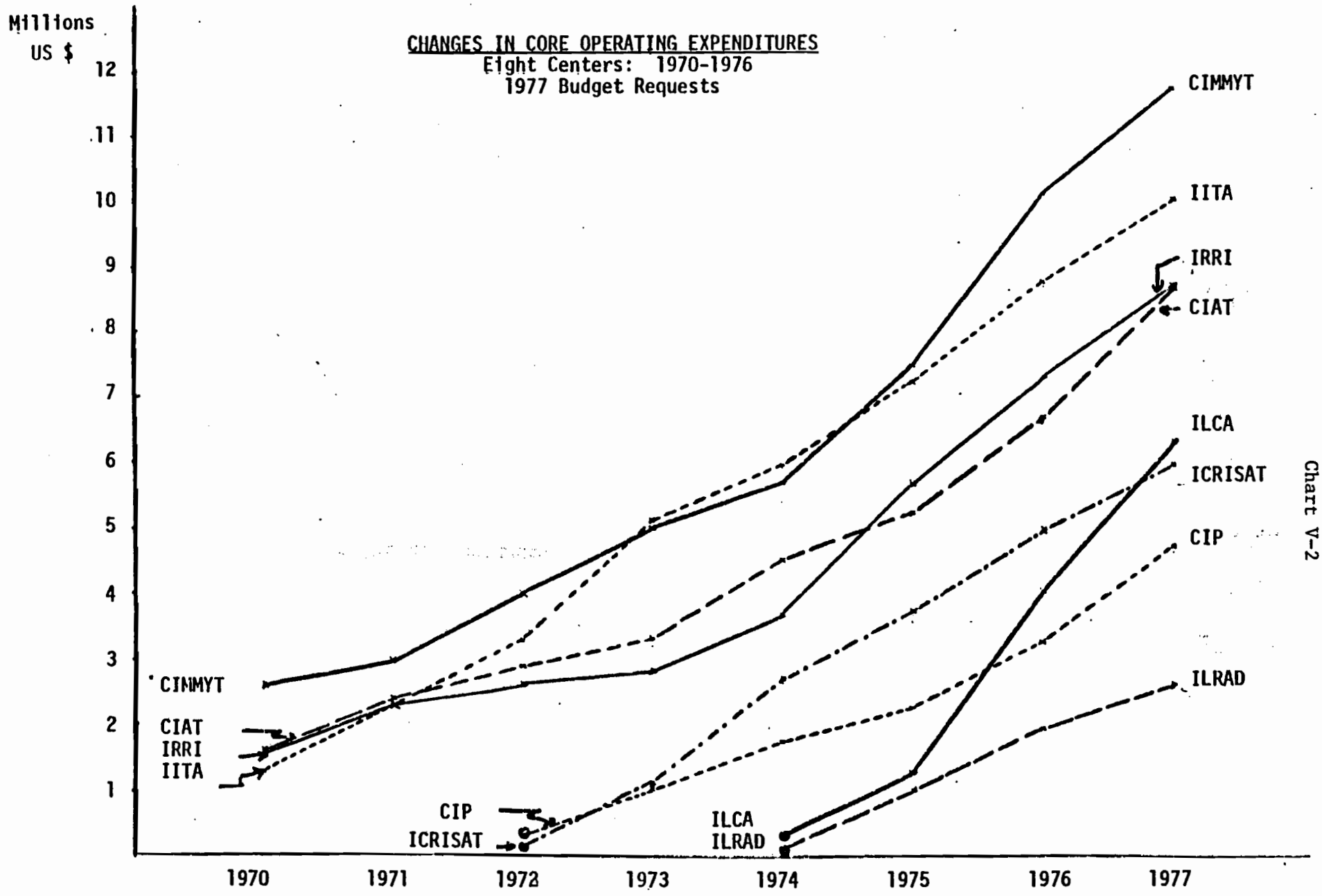
Table V- 1

CGIAR - Total Expenditures: 1972 - 1977
(Thousands of $)

	1972 actual	1973 actual	1974 actual	1975 estimated	1976 budgeted	1977 requested
A. Operating Expenditures						
CIAT	2,891	3,363	4,503	5,270	6,682	8,614
CIMMYT	4,084	5,023	5,714	7,472	10,197	11,663
CIP	352	1,024	1,768	2,265	3,297	4,754
IITA	3,270	4,898	5,959	7,201	8,789	9,999
IRRI	2,607	2,800	3,692	5,479	7,292	8,694
ICRISAT	184	1,140	2,700	3,750	4,900	5,900
ILCA			260	1,272	4,002	6,247
ILRAD			142	520	1,921	2,592
ICARDA				100	1,700	3,300
WARDA			445	555	760	1,500
GENES				555	845	1,100
CARIS				280	350	0
Total Operating	13,388	18,248	25,183	34,719	50,735	64,363
B. Capital Expenditures						
CIAT	1,557	2,700	1,000	825	900	1,400
CIMMYT	975	1,200	600	286	500	1,500
CIP		200	437	306	747	1,200
IITA	3,100	1,700	500	675	2,000	1,400
IRRI	353	284	1,100	3,409	2,200	3,200
ICRISAT		1,700	1,900	6,500	8,900	4,300
ILCA			42	306	2,398	5,400
ILRAD			600	1,886	2,650	2,900
ICARDA					1,000	3,000
Total Capital	5,985	7,784	6,179	14,193	21,295	24,300
Total Expenditure	19,373	26,032	31,362	48,912	72,030	88,663
C. Special Projects						
CIAT	98	404	632	593	902	na
CIMMYT	1,263	1,808	1,385	1,419	2,901	na
CIP			739	39	1,805	na
IITA	45	442	755	951	2,074	na
IRRI	1,323	1,982	2,040	2,185	3,508	na
ICRISAT				190	1,035	na
ILCA			25	159	184	na
ILRAD						na
ICARDA						na
Total Special Project	2,729	4,636	5,576	5,486	12,225	

na - not available
Source: Annual Center Program and Budget Reviews.

Chart V-2



Source: CGIAR Secretariat and Table V-1.

Part B of Table V-1 shows expenditures for capital from 1972 through 1976 and amounts requested for 1977.

Three comments on these figures are in order. First, the nearly 77 million dollars spent on capital significantly understates the capital costs of all CGIAR activities because it does not include the major capital investment at the original four centers before the CGIAR was established. Second, capital expenditures have escalated very rapidly in the past three years largely because the CGIAR established four new centers, each involving a major building program. Third, unless new centers are approved, capital costs should decline substantially after 1977.

Part C of Table V-1 shows the patterns of centers' expenditures from special project sources. Until 1976, special project funding increased slowly (or declined as in 1975) in monetary terms and declined in relative importance. In 1976 special project funding increased 2 1/2 times and represented in that year nearly 20 percent of annual expenditures. Two centers (CIP and IRRI) received special project funding equivalent to more than 40 percent of core budgets. On the other hand, two centers (ILCA and ILRAD) received very little or no support via this route. The major reason for this increase appears to be the rapid development of regional and other off-campus programs funded via the special project route. Chart V-3 shows the trends in the above factors.

Tables V-2 and 3, based on center program and budget papers, attempt to show the distribution of increased costs among four categories: (1) maintenance of previous programs, (2) new programs and expansion of previous programs, (3) inflation, and (4) capital. These tables show the distribution of annual operating expenditures by centers. They show that, in each of the two years for which this kind of data is available, maintenance of previous programs uses about 75 percent of budgets; new programs 15 percent and inflation 10 percent. Table V-4 shows that, if one looks at the distribution of total budgetary expenditures for eight centers in the years 1975 and 1976 the cost of maintaining ongoing programs represented 55 percent of total cost when capital expenditures are included. Obviously, as new centers mature (assuming no new centers are established) the relative importance of program maintenance will rise and that of capital expenditure and of new program cost will decline.

Trends in Donor Contributions: 1972-1976

Table V-5, prepared by the CGIAR Secretariat, provides basic information on all donor contribution to core funded programs since 1972. In 1972 there were 16 donors who contributed $20.06 million. Three donors joined and one dropped out in 1973 and total contributions rose 28 percent to $25.705 million. In 1974, two more donors joined and contributions rose 34 percent to $34.525 million. Three more donors joined in 1975 and total contributions increased 37 percent to $47.345 million. Four new donors joined in 1976 and donations rose 36 percent to $64.390 million. Thus, in five years total contributions have increased more than fourfold and the number of donors have increased from 16 to 26.

Table V-2

Sources of Increase in Expenditures - 1975

	Maintenance of Previous Programs	New Programs & Expansion of Previous Programs	Inflation	Total Operating	Capital	Total
CIMMYT	$ 5,654,000 81%	$ 140,000 2%	$ 1,159,000 17%	$ 6,953,000 100%	$ 286,000	$ 7,239,000
IRRI	3,527,000 69%	1,054,900 21%	529,100 10%	5,111,000 100%	3,409,000	8,520,000
IITA	6,134,000 91%	361,000 5%	235,000 4%	6,730,000 100%	675,000	7,405,000
CIAT	4,778,000 88%	231,000 4%	444,000 8%	5,453,000 100%	825,000	6,278,000
CIP	1,880,000 86%	109,000 5%	192,000 9%	2,181,000 100%	190,000	2,371,000
ICRISAT	2,650,000 71%	717,000 19%	383,000 10%	3,750,000 100%	6,500,000	10,250,000
ILCA	700,000 41%	996,000 59%	n.a.	1,696,000 100%	569,000	2,265,000
ILRAD	142,000 16%	732,000 84%		874,000 100%	2,222,000	3,096,000
Totals Percentages	$25,465,000 78%	$ 4,340,900 13%	$ 2,942,100 9%	$32,748,000 100%	$14,676,000	$47,424,000

Source: Annual Center Program and Budget Reviews.

Table V-3

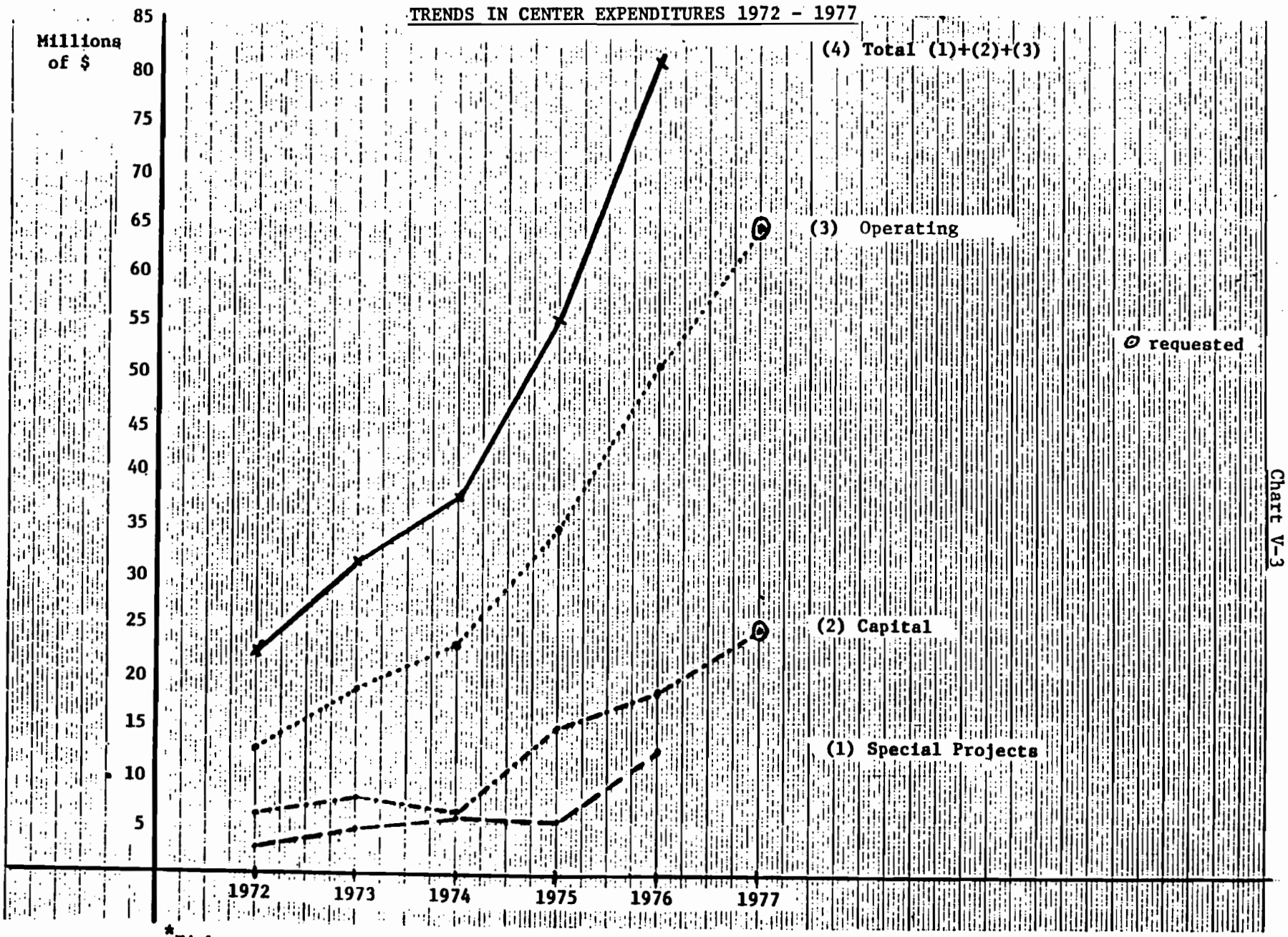
Sources of Increase in Expenditures - 1976

	Maintenance of Previous Programs	New Programs & Expansion of Previous Programs	Inflation	Total Operating	Capital	Total
CIMMYT	$ 7,995,000 70%	$ 1,990,000 17%	$ 1,498,000 13%	$11,483,000 100%	$ 509,000	$11,992,000
IRRI	5,497,000 80%	526,000 8%	854,000 1/ 12%	6,877,000 100%	2,273,000	9,150,000
IITA	7,638,000 90%	413,000 5%	472,000 2/ 5%	8,523,000 100%	1,995,000	10,518,000
CIAT	5,617,000 81%	623,000 9%	654,000 10%	6,894,000 100%	992,000	7,886,000
CIP	2,606,000 81%	260,000 8%	360,000 11%	3,226,000 100%	472,000	3,698,000
ICRISAT	3,925,000 80%	600,000 3/ 12%	375,000 3/ 8%	4,900,000 100%	5,500,000	10,400,000
ILCA	1,696,000 41%	2,396,000 59%	n.a.	4,092,000 100%	1,988,000	6,080,000
ILRAD	874,000 41%	1,256,000 59%	n.a.	2,130,000 100%	2,833,000	4,963,000
Totals Percentages	$35,848,000 74%	8,064,000 17%	$ 4,213,000 9%	$48,125,000 100%	$16,562,000	$64,687,000
ICARDA				2,600,000	1,000,000	3,600,000
WARDA				800,000		800,000
Genes Board				1,100,000		1,100,000

1/ Includes salary adjustments. 2/ Includes merit increases.
3/ There are arbitrary allocations; they are not shown separately in ICRISAT figures.

Source: Annual Center Program and Budget Reviews.

Chart V-3



*Eight centers included

Source: Table V-1.

10 Millimeters to the Centimeter

Table V-4

Components of Budget Costs - Summary
(Eight Centers only)

(Thousands of $)

	Maintenance of Previous Programs	New Programs and Expansion of Old	Inflation	Capital	Total
1975	25,465	4,341	2,942	14,678	47,424
	54%	9%	6%	31%	100%
1976	35,848	8,064	4,213	16,562	64,687
	55%	12%	7%	26%	100%

Source: Table V-2 and V-3.

Table V-5

CGIAR Contributions (1972-1976)
(US $ Millions)

Donor	Actual 1972	1973	1974	1975	Estimate 1976	Total
Asian Development Bank				.300		.300
Australia		.005	1.015	1.210	1.755	3.985
Belgium	.140	.600	.380	.620	1.765	3.505
Canada	1.160	2.530	4.675	4.340	5.735	18.440
Denmark	.250	.225	.370	.400	.465	1.710
Ford Foundation	5.315	3.675	3.000	2.800	2.000	16.790
France			.130	.410	.520	1.060
Germany		1.805	3.040	3.960	4.730	13.535
Inter-American Bank			2.030	4.120	5.000	11.150
IDRC	.175	.345	.645	.985	1.790	3.940
Iran					1.975	1.975
Italy					.100	.100
Japan	.105	.230	.265	.675	1.200	2.475
Kellogg Foundation	.155	.290	.280	.290	.300	1.315
Netherlands	.375	.430	.555	1.235	1.500	4.095
New Zealand					.100	.100
Nigeria				.645	.640	1.285
Norway	.075	.185	.445	.805	1.090	2.600
Rockefeller Foundation	3.990	4.545	3.500	2.800	2.150	16.985
Saudi Arabia					1.000	1.000
Sweden	1.000	.150	1.490	2.275	2.190	7.105
Switzerland		.410	.140	.460	.855	1.865
United Kingdom	.690	1.110	1.920	2.425	2.970	9.115
UNDP	.850	1.000	1.465	1.930	2.360	7.605
UNEP				.600	.300	.900
United States	3.770	5.390	6.805	10.835	15.100	41.900
World Bank	1.260	2.780	2.375	3.225	6.800	16.440
Kresge	.750					.750
Total	20.060	25.705	34.525	47.345[1]	64.390	192.025

1/ Contributions to WARDA, Genes and CARIS, amounting to $1.390 million, are still estimates.

Source: Consultative Group and the International Research System — An Integrative Report, 1976, Annex II, Table I.

Table V-6 presents a breakdown of the trends in core and restricted core contributions. For purposes of analysis we have divided the donors into two groups. "Initial donors" are those that have continuously contributed since 1972. (They are identified in footnote 1 of the table). The remaining donors who have joined the Group since 1972 we have called "additional donors." Chart V-4 shows graphically the trend in total contributions and those components of the total contributions accounted for by initial donors and additional donors. The proportion of the total accounted for by initial donors has declined from 100 percent in 1972 to 74 percent in 1976 showing that an increasing proportion of the rising costs of the CGIAR have been provided for by additional donors. Percent of total contribution in each year provided by first time donors in that year are shown in Table V-7.

Table V-8 presents data for special project funding by donor source for the period 1972-76.

In summary, these last four tables provide a perspective on the source of CGIAR contributions, whereas tables in earlier parts of this section provide expenditure data. Differences between the totals are explained in part by year to year carry-overs and earned income at centers.

Table V-6

CGIAR Contributions - Analysis
1972-1976 (Core and Restricted Core)
(Millions US $)

	ACTUAL				ESTIMATE	TOTAL
	1972	1973	1974	1975	1976	
All Donors	20.060	25.705	34.525	47.345	64.390	192.025
% change		(+28)	(+34)	(+37)	(+36)	
"Initial" Donors /1	20.060	23.483	28.170	35.640	47.415	
% of total	100	91	81	75	74	
"Additional" Donors /2	0	2.222	6.355	11.705	16.975	
% of total	0	9	19	25	26	

/1 Donors who contributed continuously from 1972--Belgium, Canada, Denmark, Ford Foundation, IDRC, Japan, Kellogg Foundation, Netherlands, Rockefeller Foundation, Sweden, United Kingdom, UNDP, USA, World Bank.

/2 Donors who have joined since 1972--Asian Development Bank, Australia, France, Germany, IDB, Iran, New Zealand, Nigeria, Saudi Arabia, Switzerland, UNEP.

Source: Table V-5.

Table V-7

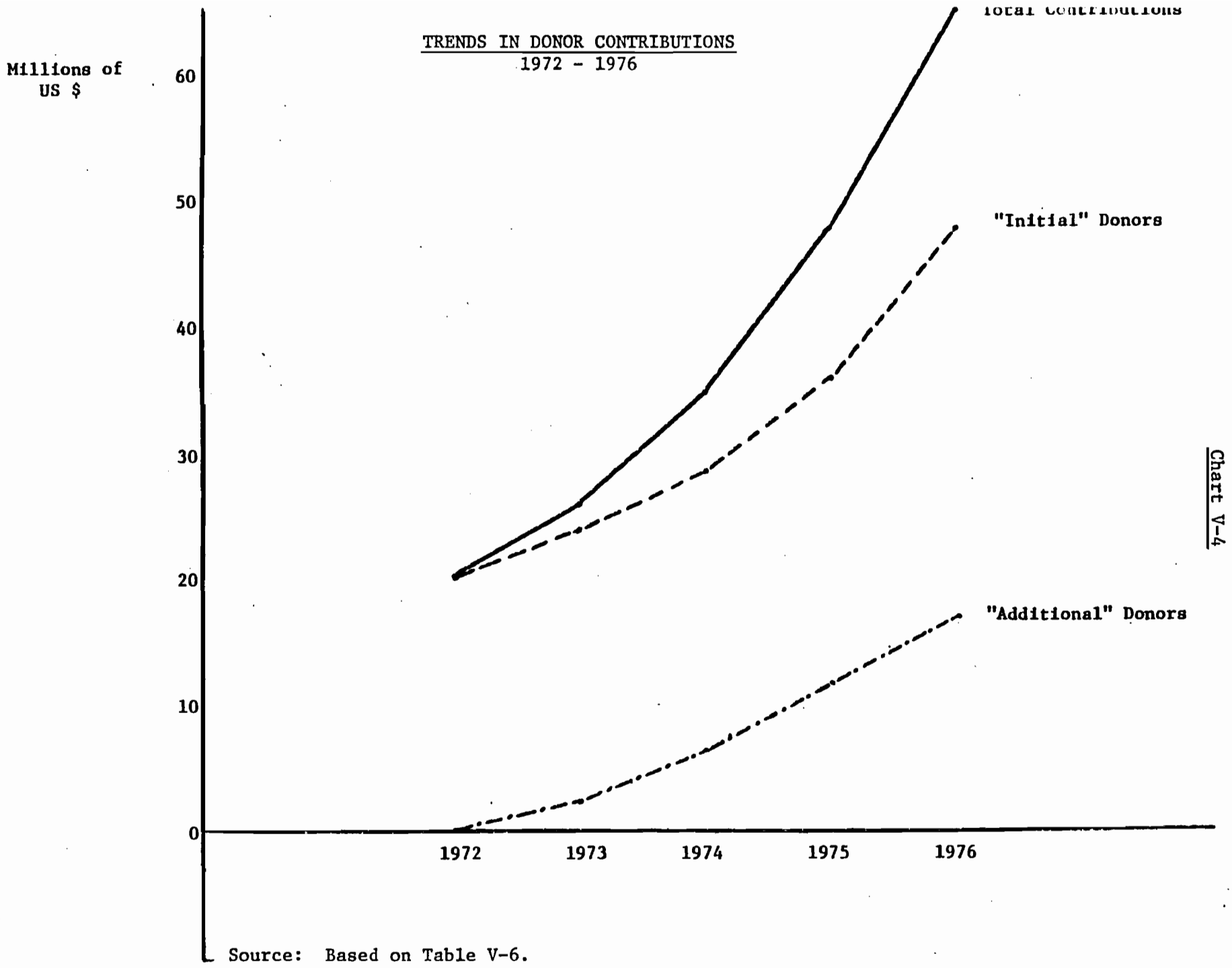
New Donors Contributions, Annually 1973 - 1976

(in millions US $)

	1973	1974	1975	1976
Total new contribution	2.220	2.160	1.545	3.175
Previous donors	23.485	32.365	45.800	61.215
Total contributions	25.705	34.525	47.345	64.390
% New donors contribution	9%	6%	3%	5%

Source: Consultative Group and the International Research System -- An Integrative Report, 1976, Annex II, Table I.

Chart V-4



Source: Based on Table V-6.

Table V-8

Special Project Contributions by Source
1972-1976
(US $ million)

Donor	1972	1973	1974	1975	1976	Total
Asian Development Bank	—	—	—	—	.325	.325
Australia	—	—	—	.135	.145	.280
Belgium	—	.101	.107	.079	.127	.414
Canada	—	—	—	—	1.426	1.426
Ford Foundation	.987	1.801	1.658	1.544	1.225	7.215
Germany	—	—	.052	.206	.130	.388
IDB	.050	.161	.748	.273	.938	2.170
IDRC	.087	.068	.448	.319	.914	1.836
Kellogg Foundation	.030	.077	—	—	—	.107
Netherlands	.091	.100	.093	.130	.409	.823
Rockefeller Foundation	.263	.307	.372	.317	.148	1.407
Switzerland	—	—	—	—	.225	.225
United Kingdom		.107	.071	.079	0	.257
UNDP	—	—	.050	.248	.976	1.274
USA	.656	.934	.968	1.230	2.826	6.614
Other						
FAO	—	.033	.059	.106	.173	.371
IMC Foundation	—	—	.015	.065	0	.080
Thailand	—	—	—	.011	.010	.021
IMP	—	—	—	.021	—	.021
Indonesia	—	.344	.142	.156	.600	1.242
N.I.H.	.050	.056	.051	—	—	.157
Zaire Government	.286	.219	.244	.111	.418	1.278
Genes Board	—	—	—	.050	—	.050
CIP	—	—	—	.075	.070	.145
IITA	—	—	—	.049	.076	.125
Unidentified[1/]	.229	.328	.458	.282	1.064	2.361
	2.729	4.636	5.536	5.486	12.225	30.612

1/ This component contains contribution from NFAC, NIH, CIDA, and Australia which were under negotiation at the time of the preparation of the budgets of the centers.

Source: CGIAR Secretariat.

PART B. ISSUES AND CONCLUSIONS

INTRODUCTION

The preceding Part A of this report has been devoted to a survey of the nature and dimensions of the task of increasing world food production and a brief account of the activities undertaken by the CGIAR in the past to help meet that problem.

In Part B, we turn to the key issues which are the concern of this review. These are presented and analyzed in three chapters:

VI. Scope and Boundaries of the CGIAR

VII. Scope, Boundaries, and Management of Centers

VIII. Planning, Evaluation, Allocation, and Management for the CGIAR and Its Family of Activities

It will be noted that some of the issues discussed in these chapters were not specifically included in the Terms of Reference. The reason is that as the review proceeded it became obvious that in many cases topics not mentioned in the Terms of Reference were important to understand those that were. For this reason they have been included in Part B.

VI. SCOPE AND BOUNDARIES OF THE CGIAR

Although the initial impulse in establishing the CGIAR was to assure adequate financing for a set of International Agricultural Research Centers, the Terms of Reference adopted for the CGIAR were much broader 1/. Subsequently, the TAC has recommended that several activities other than centers be financed through the CGIAR. In addition, suggestions have been made by various donors about direct financing of national research programs, endorsing certain activities as worthy of bilateral support (without trying to arrange direct funding through the CGIAR), and the CGIAR serving as a forum for the discussion of various topics related to strengthening agricultural research to benefit the food-deficit countries of the developing world.

The question of appropriate scope and boundaries for the activities of the CGIAR was included in the Terms of Reference for the present review and is the topic of this chapter.

Five basic questions encompass the issues involved:

1. What should be the geographic and commodity focus of the research financed through the CGIAR?

2. In what types of activities, including but not limited to research, should the CGIAR become involved?

3. What modes of operation, e.g., centers, consortia (networks), fora, should the CGIAR support?

4. How should the CGIAR interface with other agencies active in the same or complementary activities?

5. What should be the financial magnitude of the program of the CGIAR?

Geographic and Commodity Focus of the CGIAR

The serious state of the world food problem was one of the major factors leading to the establishment of the CGIAR. This concern has continued to dominate discussions about the future focus of the CGIAR.

In any approach to increasing food production, it must be recognized that crop and livestock improvement is only one component of

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1/ See Chapter V.

a more complex food production system and that other key elements, especially land and water resources, must also be considered. It is essential that this resource base be studied and improved if the latent yield potential of new crop varieties is to be realized. Crop improvement must not be an end in itself but should be considered one component in the improvement of the total system.

Because of its present structure and size, the CGIAR cannot possibly be responsible for the total efforts required to solve the food production problems and should therefore by highly selective in what it chooses to support. For this reason it has deliberately concentrated its efforts on the improvement of specific foods and cropping systems within defined geographic regions of the developing world and within ecological zones in those regions. As the organization enters its sixth year, we raise the question: Is the work of the CGIAR focused in the most relevant areas? And in these areas are the most important food commodities being studied?

Criteria for selecting the most important food-deficit regions in which to focus the work should include analysis of demographic and nutritional factors contributing to the food demand, the extent and likely duration of the deficit, the trends in yields per hectare, and total production of major food commodities. This information, together with an understanding of the prospects for increased food production or availability through imports, can give a measure of a region's likely food deficit and need for assistance in the future.

This procedure may well identify major food target areas but may miss important subregions such as the high altitude tropics or sections of the population in the lower socioeconomic groups that face serious and chronic food deficits.

Having identified the most important region, the next task is to identify the most important or potentially important foods. Importance of food sources could be judged by their contribution to the diet, their nutritional significance, especially their protein levels and other important dietary constituents, and their popularity and widespread adaptation in food-deficit regions.

Another factor to consider is the probability of changes in the demand for particular foods stemming from shifts in food preferences resulting from rising incomes of the expanding urban populations in poor countries.

Considered from the point of view of suitability for CGIAR support one could ask, will imporvement in the commodity increase food availability and improve income distribution? Will it be transferable and is it likely to be adopted? And, what is the likely scale of impact on production? Other important aspects include the potential for significant improvement and the time involved.

It should be emphasized that many donors are increasingly concerned about the problems of the small farmer and the rural poor. Both

groups have tended to receive less emphasis in previous agricultural development efforts. It must be recognized that the economic problems of these groups cannot be solved by agricultural technology alone. However, research supported by the CGIAR should take special cognizance of their needs.

The Koffsky 1/ report commissioned for this study and summarized in Chapter I concluded that emphasis should be given to the major sources of food in food-deficit, low income countries with shortages of foreign exchange. As shown in Chart I-1 and Table I-2, these important sources of food are the major cereals, roots and tubers, and grain legumes. Koffsky's conclusions are similar to those of TAC in their revised priorities paper.2/ TAC, using a comparable set of criteria to those previously listed, has recommended research on the major cereals, roots and tubers, grain legumes and ruminant livestock all of which are widely consumed and which collectively represent 80 percent of the food supply of the developing world.3/ On the basis of our criteria, Koffsky's analysis, and other recent studies of the world food situation,4/ it is apparent that the CGIAR has been making good choices regarding geographic regions and food sources.

Some important food crops, and also some non-food crops which can contribute to food availability of rural populations through the increased income they can generate have not been recommended by TAC at this stage. The reasons for not recommending them at this time appear soundly based, but they should not be excluded from consideration in the future.

> Conclusion. The Koffsky analysis as summarized in Chapter I clearly points out the need for increased food output. In fact, his study in conjunction with the analysis in Chapters II, III, and IV indicate that there is an overwhelming need for research in the future and therefore a need to continue activities supported by the CGIAR. We conclude that the present CGIAR coverage of geographic areas and food commodities is appropriate and that there appear to be no major gaps. In addition to the issue of coverage, the fact that several center programs are not yet fully developed and that there is a reduced likelihood of major increases in fund availability (which is

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1/ Koffsky, "World Food Needs."

2/ See Annex 4.

3/ Food and Agriculture Organization, "Agricultural Commodity Projections, 1970-80," Vol. II (FAO, Rome) 1971.

4/ "Meeting Food Needs in the Developing World," IFPRI; and "NRC Study on World Food and Nutrition," Report of the Steering Committee of the Commission on International Relations, National Research Council, National Academy of Sciences (Washington, D.C., 1975).

discussed later in this chapter), suggest that there are good reasons for not considering significant expansion of this coverage in the near future. However, TAC should continue to be active in exploring needs.

Types of CGIAR Activities

From the beginning, the centers supported through the CGIAR have concentrated primarily on research and technology development related to specific food commodities or to particular ecological zones. In conjunction with that major emphasis they have conducted a considerable amount of training. They have participated in efforts to get their technologies adopted in individual countries (technology transfer). They have arranged for information collection and exchange.

The current issue is to what extent the CGIAR should support additional activities whose primary focus is different from those presently supported. For example, should the CGIAR engage in direct support of national programs or extension activities?

In analyzing this issue we have considered four questions:

(1) Is an international effort the best approach to the problem or would national activities, perhaps supported by external aid, be preferable?

(2) Does the CGIAR have a comparative advantage regarding particular activities or are there other agencies that might deal equally well with the problems?

(3) Could a particular investment have a direct impact on food production, or are other intermediate links needed before the technology can be used? For example, the development of a new fertilizer technology might depend on substantial national or international investment before the results of the technology could be useful to farmers in increasing food output. On the other hand, an agronomic package requiring no complementary infrastructure or investment might be directly useable.

(4) Would supporting additional activities unduly complicate administration or divert resources from existing CGIAR activities?

It is understandable that individual donors may wish to undertake additional research activities under the aegis of the CGIAR, using the unique mechanism which it provides. We are fully sympathetic with the desire in the long run but, for the next three years we counsel against it because of the need to bring present centers to maturity and to limit the administrative load on the CGIAR instrumentalities during their formative years.

Although the existing centers have many characteristics in common, they also have unique characteristics related to their respective mandates. ILCA, ILRAD, and IITA have distinctive mandates that require the application of different criteria to evaluate and fund their programs. The same is true of WARDA and IBPGR. Increasing heterogeneity of CGIAR activities makes it increasingly difficult for a consultative, informal organization with funding designated independently by donor-members to keep its activities in perspective.

Consequently, it is our judgement that quite apart from questions of available funds, the CGIAR's capacity to add new activities and bring them to maturity is limited. Therefore, any suggestion for taking on activities different from those now supported should be carefully reviewed with regard to their potential impact on existing activities and on the CGIAR mechanism.

The one activity that we would advise adding is a formal forum function. Establishing the CGIAR resulted in representatives of a large number of donor-agencies meeting twice annually, thereby creating a situation that makes it easier for them to confer, not only about international agricultural research and activities of the CGIAR, but informally about many other matters in which they have mutual interests; i.e., research activities other than those of the CGIAR, bilateral aid to various types of national programs, etc. Discussions of CGIAR activities at these meetings tend to be focused on individual centers. With proper preparation, they could provide opportunities to discuss specific issues and program components that characterize most or all centers as well as other problems relating to research and technology in developing countries. These meetings should include researchers from developing countries.

We suggest that a program of forum discussions be organized by the CGIAR. Some discussions would be designed for representatives of donor-agencies to participate; others would be more appropriate for technical personnel from those agencies, from the centers, from other aid agencies, and from national programs in the developing countries. Topics for such discussions might include problems of developing national research activities; the impact of centers on national programs; the magnitude, nature and quality of research in selected developing countries, etc. There will need to be careful planning of these discussions. We suggest the TAC or other agencies be asked to commission discussion papers about specific aspects of research programs, both national and international to be presented at these fora.

> Conclusion. We conclude that the CGIAR should limit its efforts for the next three years to the support of its present activities which concentrate largely on research and technology development. Other agencies, including donor-members of the CGIAR, now engage directly in activities, other than research, funded both bilaterally and multilaterally. We believe it would be both confusing and competitive for the CGIAR, apart from its support of centers, to mount programs in these other fields, important as they are.

The only new activity we recommend for the CGIAR is the organization of fora to discuss issues of relevance to the CGIAR, donors, and developing countries.

After the next three years, we suggest that the four questions discussed above would still be appropriate when considering new activities that the CGIAR might contemplate undertaking.

Modes of Operation in Research and Technology Development

Supporting research and technology development to raise technical and economic ceilings for food production has been the focus of CGIAR activities from the beginning, and we recommend that this continue. To accomplish that, the CGIAR has chosen to establish and support centers and other activities mandated to do so. However, the kind of center supported has not been, and need not be, homogeneous. Centers could have a global, regional, or ecological zone focus, and they could be focused on a commodity or systems approach or some combination of the above. They also could have an interdisciplinary production, factor, or disciplinary focus. To date, the CGIAR has focused primarily on the interdisciplinary production approach. Other modes of operation have been proposed, and the CGIAR has, in certain instances, such as WARDA, IBPGR and CARIS, adopted them.

The choice of mode is necessarily a pragmatic one and has to be based on experience and the particular circumstances.

Centers. International Centers, the dominant mode of the CGIAR, are in many respects unique institutions.

Their strength and comparative advantage is that they have a great deal of independence, are strongly mission oriented, and have a sharp focus on applied research and technology development in relation to commodities that are of crucial importance in increasing food production in low-income food-deficit countries of the world. Members of centers work in interdisciplinary teams which permit direct personal interaction and maximize the potential for increasing production of specific food commodities. Simultaneously, this approach has an important demonstration effect for national programs that have, heretofore, been strongly discipline oriented.

Because of the ethos and excellent reputation of the centers, the emoluments, and good working facilities, each center has been able to attract a critical mass of first class scientists from all parts of the world. The mode of operation of the centers has provided those scientists with a stable and well-equipped research environment.

Because of their international status, the centers have been able to assemble and recombine extensive gene pools of the crops on which they concentrate and to maximize the genetic variability in these for use in breeding programs.

Largely on the basis of the early success with wheat and rice, the centers have developed a global reputation that allows them freedom in scientific exchange that no national program could hope to achieve. As a result, they can assemble and subject to testing in many countries new technology built around improved genetic material at a faster rate and on a greater scale than any national program. This results in a greater potential impact of the new technology and a considerable saving in time in its development.

As a byproduct of the centers' special character and their commodity or activity focus, the quality of the staff, equipment and facilities, emphasis on an interdisciplinary team approach, and their ability and willingness to develop cooperative working links with appropriate research groups in national programs, they have excellent possibilities for training technicians and scientists from developing countries. Although there is a limit to the amount of time and effort that the centers can put into training, it clearly contributes to the strengthening of national research programs and the building of a collegiate network of scientists and technicians who cooperate in the breeding work at the centers.

In summary the centers have already demonstrated their capacity for success and have identified areas in which they are uniquely successful. It is our judgment that this uniqueness applies particularly to commodity or systems oriented centers whose forte is the interdisciplinary team approach. It is less clear that these characteristics could apply to factor or discipline oriented centers that are more comparable to traditional developed country research approaches. Therefore, we conclude that the center approach has much merit and is uniquely fitted to the character of the CGIAR.

Consortia (Networks). The consortium approach (sometimes referred to as the network approach) to supporting international research has many attractive features. It attempts to build on existing institutions rather than creating new ones. It is, therefore, significantly cheaper than the center approach, to the extent that it need not involve major capital expenditures. Finally, it appears to involve the intended users of the research more directly in the process.

However, there are also potential weaknesses. First, a consortium is only as good as the quality of its components. Creating a cooperative research consortium to work on a commodity is unlikely to succeed unless the prerequisite of established research institutions has already been met. Here the situation in various countries of the developing world is very uneven. Second, the allocation of research funds by a committee of potential recipients of research funds is likely to lead more to political allocations than to hard programmatic judgments. While this defect might be overcome

by some other arrangements for fund allocation, there are few examples of success. History should not be allowed to rule out promising new proposals, but past experience suggests caution with respect to using consortia as a major mode of operation.

Direct Support of National Programs. Centers, as an integral part of their research methodology, have considerable interaction with national research programs. One purpose of their training activities is to strengthen national programs; a major focus of their seminars, conferences, and of the exchange of scientific personnel is similar.

Important as they are, such activities are confined largely to the commodities on which each center works, and the competence of center staff by no means covers the manifold problems to be faced in strengthening national research programs.1/

Strengthening national research programs is a topic of concern to many other bilateral and multilateral agencies, and there is widespread recognition that this critical issue does not receive nearly the emphasis that it deserves. For that reason there have been proposals that the CGIAR adopt direct support of national research programs as an additional major activity. However, the magnitude and geographic dispersion of needed support for national research programs is so overwhelming that it would overburden the CGIAR approach to such an extent that other activities would suffer.

> Conclusion. We conclude that, for the next three years the CGIAR should continue to concentrate on the support of centers and the current set of related activities and caution against undertaking any major new activities. This does not preclude continuing exploration by TAC of possible additional activities. Beyond that period, careful analysis should precede expansion of CGIAR activities.

Interfaces with Other Agencies

It is important that the CGIAR be constantly aware of what is being done by other agencies in the same or related field. It is our judgment that the centers by and large are quite well informed about complementary activities that relate to their mandates. The procedure of having related activities, e.g., IFPRI, IFDC, AVRDC, etc., report on their activities to the CGIAR is also valuable. Finally, the forum role discussed in the preceding section, if adopted by the CGIAR, could further increase interaction among agencies if some personnel from other agencies are invited to participate.

1/ See Chapter IV and VII.

Conclusion. If the CGIAR continues to restrict activities to those where it has a strong comparative advantage, we see the question of relating to other organizations as not presently a serious problem. We, therefore, conclude that no formal mechanism for dealing with interfaces need be developed.

Financial Magnitude of CGIAR Program

As shown above in Chapter V the cost of the CGIAR program has risen rapidly, matched thus far by equally rapid increases in donor support. As key question for the future is whether donor funding can be expected to continue to rise as rapidly as it has in the past.

Donor opinions on the rate of cost increase and availability of support vary. Some are relatively optimistic and feel that the fund availability need not be a constraining factor if the research programs continue to be highly productive and useful. Others feel that the total annual cost of the program is approaching a limit and that some way must be found to control future growth.

What is needed are (1) suggestions about procedures to be followed in considering new activities in the future; (2) better estimates of the probable cost of present activities over the next five years, based on different assumptions about program; and (3) some indication of potential fund availability.

Procedures for Future Decisions About New Programs. First, there is need for a careful analysis of the magnitude of commitments in terms of both initial costs (primarily capital investment) and anticipated annual program costs. One of the factors often overlooked in assessing the rapid increase in costs these past three years has been the fact that they have included a large component of capital costs because several centers are still in the developmental phase. If no new activities are undertaken in the next five years that component of costs will decline.

Second, an estimate of the minimum length of required time commitment to a center or related activity is needed. The CGIAR is supporting research enterprises whose life before payoff can be expected to be long because of the incremental nature of research results as discussed in Part A. Thus, the time horizons of commitments need careful attention.

Third, as a minimum, some qualitative judgment is needed about the potential payoff in terms of expected results and the length of time required to produce those results. We have pointed out in Chapter III the difficulties of quantitative cost-benefit ratio or rate of return analysis being applied to research activities. This does not, however, obviate the need for paying continuing attention to the goals of research enterprises, to the costs of reaching them and to the progress being made.

Projection of Costs Under Alternative Assumptions. Item VII of the Terms of Reference for this review state in part -- "The Committee will estimate the level of financing required by the international centers and other CGIAR supported activities over the next five years based on different assumptions with respect to programs." 1/

The projections that follow are restricted to a limited set of alternative models, all of which assume that the recommendations outlined earlier in this chapter are accepted. At the end, we give some examples of additional costs that would be added in case of CGIAR should decide to undertake additional activities.

The estimates of cost through the five-year period 1977-1981 are presented in terms of constant 1977 dollars and also in terms of current monetary value for each year assuming a 10 percent per year inflation rate. The advantage of presenting both estimates is that it allows the substitution of alternative inflation rates to ascertain their effects on total costs. It should also be borne in mind that while the constant dollars cost estimates are more reassuring in terms of magnitudes, when the financing occurs, the actual cost will be in terms of that year's dollars.

Four alternative levels of cost are presented. Each is described in turn.

Model I: The "Austerity" model assumes that once a center has reached maturity, it will receive no new funds for fixed capital or new programs. Budget increases would reflect only inflationary and normal non-cost-of-living salary increases. This model is perceived to represent the minimum that the current system would cost with no new centers or activities and without a real decline in existing programs. This model is based on the following assumptions: (1) no new activities are added, (2) present activities are continued at existing levels to maintain approved programs, and (3) the newer incomplete centers are completed to originally planned staff and physical size.

IRRI, CIMMYT, IITA, and CIAT were classified as mature centers, and their 1976 budgets were used as the base. For budgets 1977 through 1981 their core operating budgets were increased by 3 percent per year for non-cost-of-living related salary increases such as merit increases and promotion. 2/ For these centers no fixed capital expenditures were included.

1/ See Introduction.

2/ The 3 percent is based on the fact that for most established centers salary costs are approximately 60 percent of operating budget, and that merit and promotion increases in some comparable research institutions average about 5 percent of salary costs.

Second, maturity dates for the remaining centers were assigned as follows: CIP, 1977; ILRAD and ICRISAT, 1978; and ICARDA and ILCA 1980. In the years prior to maturity the centers own projected costs for both staff and capital were used. The one exception was ILCA where their budgeted inflation estimates were deflated beyond 1977. For the years after maturity, we allowed the same 3 percent per year for salary increases as for the mature centers. Also, after maturity no capital expenditures were included.

Regarding other activities, the 1976 budgets of WARDA and IBPGR were increased by 3 percent per year. No funding beyond 1976 for CARIS was included. After the basic projections, 10 percent inflation per year was added to core operating budgets to get monetary totals.

Model II "Normal": This model accepts budget costs as projected by the centers until 1980 and increases budgets beyond 1980 with allowances for increased salary costs and modest increases for new programs and capital. It probably indicates lower annual costs that would prevail with unrestrained growth because the levels of increase in new programs and capital it indicates are below the actual averages of the last several years. The model is based on the assumptions: that no new activities are added and all existing activities are funded at projected levels until 1980 with allowance for modest program growth for 1981.

For all centers their projected core operating and capital costs through 1980 were used as presented in their 1977 program and budget proposals. Beyond 1980 we increased core operating budgets by 8 percent per year on the basis of 3 percent salary costs and 5 percent new program growth. Capital budgets were increased by 5 percent of the previous year's core operating budgets.

For IBPGR and WARDA, which have not projected budgets beyond 1977, their subsequent core budgets were increased by 3 percent per year. Again current (monetary) dollar cost were derived by using a 10 percent per year inflation rate.

Model III "Limit on Senior Scientists": Model III is a modification of Model II in that senior scientists were frozen at the 1976 level if that exceeded 60 or were frozen at 60 when that number was reached. The only center affected is IITA and as a result there is little cost difference between this model and Model II.

Model IV "Budgetary Growth Paths": It is recommended later in the report that centers be requested to develop budgetary growth paths using the concept of a desirable size for centers. The model presented here is a preliminary estimate of what these growth paths might look like.

Four centers are now at least seven years old and can be presumed to be at a stage of maturity where they might level off either in number of staff or in the size of their core budgets if the principle of a maximum reasonable size of center is to be adopted. They are IRRI, CIMMYT, CIAT, and IITA.

For the other centers, it seems reasonable to presume that ICRISAT, ILCA, and ICARDA may ultimately be comparable in size to the four older centers and that they should be allowed (for the next three years) to grow toward that size as rapidly as is (a) prudent internally and (b) supportable by the overall level of donor financing likely to be available. CIP and ILRAD, because of the nature of their current mandates, should probably have a smaller ultimate size.

Taking all of the of the above factors into account, it is assumed that for the next three years, a maximum size of core operating budgets be set at $12 million (in 1977 dollars) and that the permissable rate of growth of individual centers be as shown in Chart VI-1. This model sets as an upper limit an amount just above that requested for CIMMYT in 1977 which, excluding inflation, is only slightly above its budget in 1976. It sets growth paths for the other three older centers, IRRI, CIAT, and IITA, that begin to level off but continue to grow at a modest rate toward CIMMYI's size in the period 1977-79. This is done in order to give some priority to the needs of newer centers that are younger and should now be growing rapidly.

It would allow the operating budgets of ICRISAT, ILCA, and ICARDA to grow at the rate of $1 million annually, in real terms. Historically, that is approximately the rate at which the older centers grow at similar periods in their development. It would allow CIP and ILRAD to grow slightly less rapidly than other centers in the next three years, in anticipation that an ultimate size for each of them might be set somewhere in the range of $7.5 million for CIP and $5.5 million for ILRAD.

It is recognized that these assumptions are somewhat arbitrary and can be criticized from many standpoints. However, they are workable; they would allow forward planning by both centers and donors; they would leave substantive allocations within centers to the centers and their trustees.

Under these assumptions the requested core operating budgets for 1977 as presented at centers week were used except for ILCA, which was reduced from the $6.247 million requested to $5 million. This still is an increase of $1.246 million over estimated expenditures in 1976.

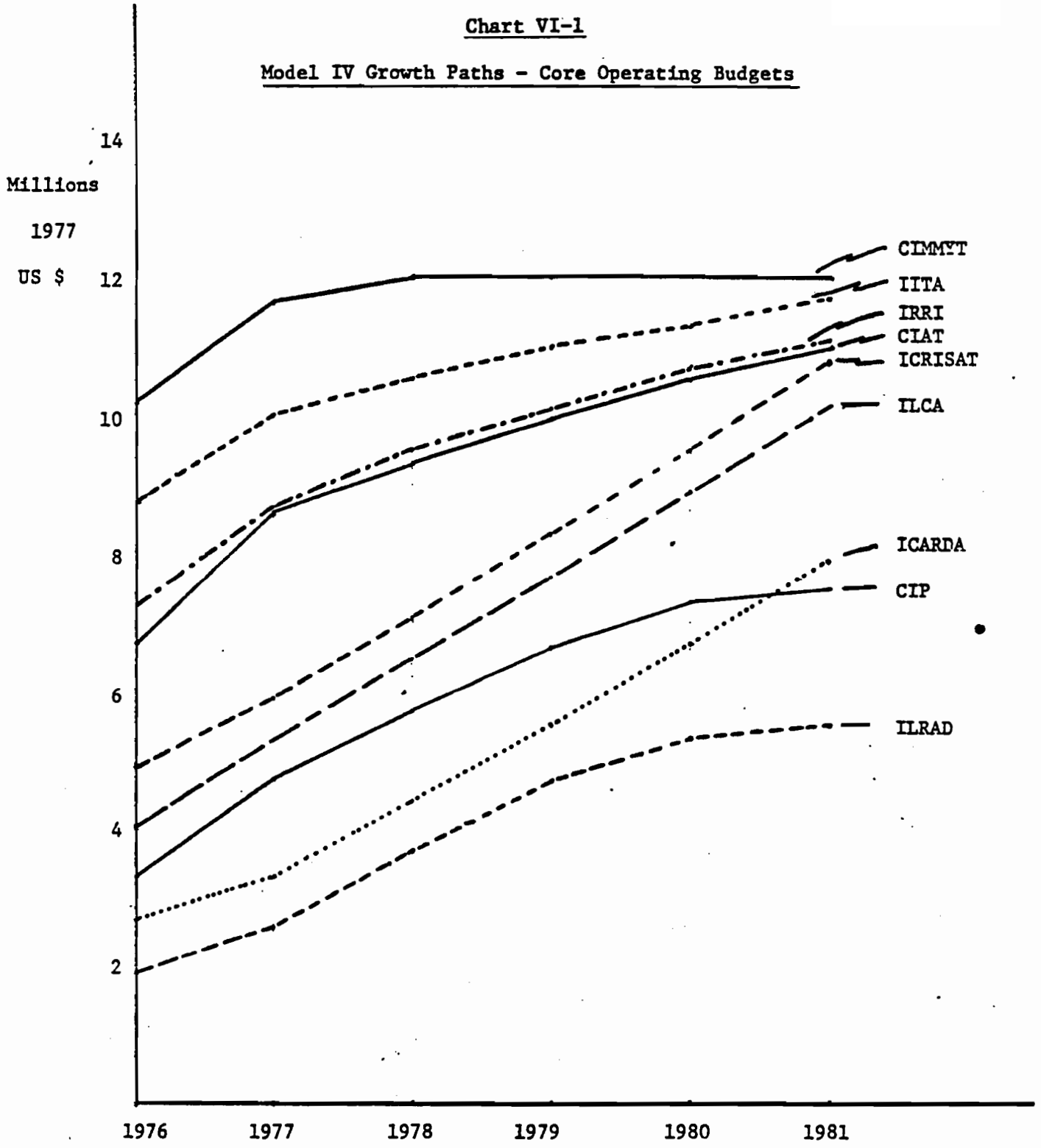
All other budgets lie within, or reasonably near, the amounts the proposed growth paths would indicate if the base year had been 1976.

Capital estimates in this model are generated by excluding working capital items in the 1977 budget and by deferring $3.5 million of capital expenditures requested for 1977 to 1978.

The results of the four models are presented in Table VI-1. The range of projected costs in 1981 is from $73.5 million to $95.1 million in 1977 dollars. Comparable monetary (current) dollar figures range from $108.7 million to $131.3 million. The lower figure is the Austerity Model, the higher the Growth Path Model. The so-called Normal Model is $88.5 million in real terms and $121.4 in current monetary terms.

Chart VI-1

Model IV Growth Paths - Core Operating Budgets



It should be noted that the Normal Model is still very conservative even though center projections are accepted. In many instances, centers project no increase in budget in real terms beyond 1978. This is unrealistic. All models show a leveling between 1977 and 1978, because capital programs at the newer centers will be largely completed and any contemplated new activities would not yet be on stream. The Austerity Model is perhaps unrealistic in the sense that it allows no replacement of equipment or capital in mature centers. Finally, all estimates in current dollars, especially as we approach 1981 are uncertain because of the allowances for inflation.

The above four models assumed no additional new activities. If the CGIAR were to take on additional activities it would simply have to add the additional cost to any one of the models presented above in 1977. As examples, the water buffalo proposal discussed by TAC and the IDRC. post harvest proposal are used in Table VI-2. The estimates for the water buffalo program presented to TAC through 1980 were used. The 1981 budget simply increased by 3 percent. For the Post Harvest Technology Project we began with a basic cost of $600,000 based on $100,000 per year total cost per member of a five-person technical committee and $100,000 per year for administrative and advisory committee costs. In years beyond 1977, we increased the previous year's budget by 3 percent. In both cases no capital costs were included. The detailed projections are in the upper portion of Table VI-2.

If the CGIAR chose to add one or more new centers, the potential costs are presented in the lower part of Table VI-2.

The actual costs of ICRISAT and projected costs at ICARDA were used as general guidelines. ICRISAT had capital costs of $21.150 million and core costs of $18.149 million for the years 1973 to 1977. ICARDA is projected to have capital costs of $17.9 million and core costs of $26.756 million for the years 1976-80.

We asumed that a new center beginning in 1978 would have four-year capital costs of $14 million and core costs of $16 million. For a second center beginning in 1979, we assumed a three-year cost of $6 million for capital and $9 million for cre for the years 1979-81. In both cases the full start-up cost would not incurred by the end of 1981. We estimate full capital costs of new centers of the scope of ICRISAT and ICARDA would exceed $25 million.

In summary, if the CGIAR were to adopt the Normal Model, add two new activities and two new centers the total current monetary cost of the CGIAR family by 1981 would be $148.8 million. It is left to the reader to compute other combinations.

Future Funding Potential. The Terms of Reference also requested that some estimate be made of future fund availability. Our basic view is that projecting future fund availability is even more hazardous than projecting costs. Almost every donor interviewed reported that if they had been asked three years ago if their contributions would be at the level they are for 1976 they would have answered emphatically "no" Thus to some extent demand creates its own supply.

TABLE VI-I
FUTURE COSTS OF CGIAR ALTERNATIVES PROJECTED TO 1981 1/

A. PROJECTIONS IN CONSTANT 1977 DOLLARS

	1976	1977	1978	1979	1980	1981
	Estim.	PROJECTED				
	(millions of constant 1977 dollars)					
MODEL I: AUSTERITY						
Capital	15.9	16.7	7.3	5.9	6.0	0.0
Operating	51.0	57.9	63.2	67.7	71.3	73.5
TOTAL	66.9	74.6	70.5	73.6	77.3	73.5
MODEL II: NORMAL						
Capital	15.9	24.7	12.3	10.5	8.7	4.8
Operating	51.0	62.2	67.8	72.8	76.6	83.7
TOTAL	66.9	86.9	80.1	83.3	85.3	88.5
MODEL III: NORMAL WITH MAXIMUM SIZE (IITA 1976, CIMMYT 1977)						
Capital	15.9	24.7	12.3	10.5	8.7	4.8
Operating	51.0	61.3	66.7	72.0	76.2	82.6
TOTAL	66.9	86.0	79.0	82.5	84.9	87.6
MODEL IV: INTERIM BUDGETARY GROWTH PATHS						
Capital	15.9	18.9	13.3	7.6	5.7	4.5
Operating	51.0	62.4	70.9	78.3	85.2	90.6
TOTAL	66.9	81.3	84.2	85.9	90.9	95.1

B. PROJECTIONS INCLUDING 10% INFLATION PER YEAR (millions of current dollars)

MODEL I: AUSTERITY TOTAL	66.9	78.2	80.9	90.7	102.3	108.7
MODEL II: NORMAL TOTAL	66.9	88.8	89.0	99.4	109.0	121.4
MODEL III: SIZE LIMIT TOTAL	66.9	88.2	88.4	93.8	108.8	120.4
MODEL IV: GROWTH PATHS TOTAL	66.9	81.3	91.3	101.6	116.4	131.3

1/ Does not include costs of secretariats.

TABLE VI-2

Future Potential Costs for CGIAR with New Activities Included

A - New Activities B - New Center(s)

	1977	1978	1979	1980	1981
	millions of constant 1977 dollars				
A. New Activities					
Water buffalo-core	.3	1.5	1.8	2.1	2.4
Post harvest-core	.6	.7	.8	.8	1.0
Total	.9	2.2	2.6	2.9	3.4
B. New Center(s)					
(1) 1978 Capital			2.0	4.0	8.0
Core operating		1.0	3.0	5.0	7.0
Total		1.0	5.0	9.0	15.0
(2) 1979 Capital				2.0	4.0
Core operating			1.0	3.0	5.0
Total			1.0	5.0	9.0
With both centers added		1.0	6.0	14.0	24.0

Donors we interviewed mainly anticipated continued support of the CGIAR with modest increases in real terms and, as a minimum, increased contributions to cover inflation. A few project significant real increases. Few if any project declines. Most donors, however, are firm in the view that the rate of increase of CGIAR costs over the past four years cannot be sustained.

Practically all donors tie possibilities of increases to the practical achievements of the CGIAR centers and other activities. Many emphasize strongly that the possibilities for increased contributions depend on the extent to which the results of CGIAR research activities appear in practical farming in developing countries.

We have consulted with the CGIAR Secretariat and others regarding the potential for new donors. It appears that the obvious pool of potential donors is smaller than in previous years. The EEC and IFAD are seen as possibilities. With a lesser degree of certainty, some additional OPEC countries and regional banks are also suggested. One thing is clear however, that potential new donors are likely to have more regional or special interests in supporting activities than previous donors. Thus, as in the past, future contributions to the CGIAR will depend on established donors maintaining or increasing their contributions.

> Conclusion. On the basis of discussions with donors about future fund availability, and analysis of potential new donors, we conclude that the CGIAR will be able to finance modest real growth in the existing centers for the next three to five years. However, we doubt that the climate is right for undertaking major new activities. This conclusion coupled with the previous conclusions in this chapter argue strongly that the next three years should be a period of consolidation. While we conclude that only modest real growth of the centers as a group is realistic in the near future, we recognize that the rate of growth should vary among centers because several of them are young and need to reach maturity.

VII. SCOPE, BOUNDARIES, AND MANAGEMENT OF CENTERS

Our analysis so far has concluded that the CGIAR should support, as its primary focus, research and technology development on important food sources primarily through international centers. The next task is to discuss issues that arise in conjunction with the scope, boundaries, and management of center programs.1/

The chapter begins with the concept of an integrated program because it is our conclusion that defining programs by source of funds or as on-campus or outreach is misleading and does an injustice to the necessarily integrated way in which centers approach their tasks. We, therefore, discuss only those factors that potentially distort a center's program. Within this context of an integrated program we discuss the question of program balance, the thorny question of cooperation with LDC national programs, interfaces with advanced research institutes, and the issues relating to the different sources of funding (the so called special projects issue). We then proceed to a discussion of the desirable size of centers and the longevity of programs within centers and the necessity for developing more effective forward planning procedures. Finally, issues of center management are addressed, including the problems of inter-center relationships, the selection and appointment of board members, and the maintenance of the vigor and quality of the staff.

Concept of a Fully Integrated Program

As discussed in Chapter V, centers are involved in a range of research activities in many countries. The program of a center is multifaceted and is influenced by a number of factors. It is influenced by the mandate of the center, the location of the center, the geography of its crop or crops, the research strategy adopted, the mix of activities undertaken, the necessity for cooperation with national programs, the desirability for interaction with advanced country research institutes, and by the sources of funds. The first three of these factors are determined when the center is created and the fourth is clearly specific to the center. The latter four are of relevance to this discussion.

A center in developing its program attempts to achieve a rational balance between the various research projects and other related activities in which it is engaged, but a number of factors can distort this balance. The most serious have been the existence of two independent sources of funds, the practice of defining programs by the source of the funds and the lack of any attempt by centers to describe and

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1/ We have deliberately focused our analysis on centers because they account for over 95 percent of cost of the system. However, most of the principles expressed in this chapter apply equally well to the other activities supported by the Group.

present an integrated program for review. The funds derived from individual donors, independent of the CGIAR, have been used to fund a range of projects especially those involving support for cooperative programs in LDCs and other off-campus activities involving interactions with advanced research institutions and training. These are the so called special projects which are discussed in greater detail later in this chapter. In the absence of any agreed upon principles to guide centers in the acceptance of special projects and the lack of integration between these and the projects funded through the CGIAR, there is a real danger that the balance of the center program can be severely distorted and deflected from the primary research objective. The task of the center, given these multiple influences, is to create and maintain an internally consistent, integrated program.

> Conclusion. Our purpose in this section has been to draw together a set of apparently different components into the concept of a holistic program. It is essential that a center's program be considered as an integrated whole. To recognize the interdependence of these factors underscores the importance of balance, and the need for integrated use of multiple sources of funds. It also explains why it is difficult to deal with these factors in any crisp policy manner. Our overall judgment is that the centers and their boards are best qualified to make the ultimate decision on these important issues. What we are proposing in the subsequent sections are some possible guidelines for making these decisions.

Program Complementarity and Balance

The character and composition of different centers' programs rightly vary in accordance with their mandates and the ecological zones in which they operate. Some research programs are commodity oriented with a strong emphasis on genetic improvement. Others are cropping systems oriented. Increasingly, however, centers do both, and in addition are involved in socioeconomic research and training.

Some idea of the relative emphasis given to these various programs by different centers in 1976 is indicated in Table VII-1.

These data confirm that interdisciplinary commodity research, including off-campus cooperative research with national programs is the dominant activity at the developed centers. IITA and IRRI are currently spending about 25 percent of their core funds on cropping systems research which is closely integrated with their commodity programs. The figures quoted for training are probably underestimated. Much of the cooperative research with national programs has a training component

Table VII-1

Proportion of Core Operating Funds Devoted to Various Aspects of Research and Training in 1976

	Commodity Research[1/] including cooperation with national programs	Systems Research	Socioeconomic Research	Training and Conferences	Support Services Operating	General Administration	Total
CIAT	54	--[2/]	--[2/]	12	24	10	100
CIMMYT	53	--	3	16	18	10	100
CIP	56	--	3	13	17	11	100
IITA	34[4/]	28	--[3/]	6	21	11	100
IRRI	34	26	4	5	23	9	100

1/ Cooperative research involves a training component.

2/ Economic and systems research integrated with commodity programs. No separate budget item.

3/ Economic research integrated with systems research.

4/ Research support allocated to commodity and systems research in proportion 3.2.

Source: 1977 Program and Budget Proposals of centers.

that has not been identified. A similar analysis of cooperative research (country) programs supported by special project funds for these same centers in 1976 indicates that approximately 80 percent of the funds were devoted to cooperative commodity research and 20 percent to training1/.

The integration and balance between the major thrusts in a center's program is important and the only issue would appear to be, what constitutes a desirable balance and how is this judgment made?

Below four major program thrusts are summarized which complement the central commodity program of the centers. Significant overexpansion of any of these could unbalance the center's total integrated program.

Cropping and animal production systems research has been adopted by a number of centers as the most effective framework in which to develop its research program. Frequently the approach has been to identify the most critical underlying constraint in the ecological zone involved, such as water or soil management in the case of IITA and ICRISAT, and then tailor particular crops or cropping systems to meet these major constraints. There is no evidence that current investment by centers in such activities is excessive or out of balance with the remainder of the program.

Cooperation with national programs is an integral component of the research activities of all centers. It is essential to their international testing programs. It is also necessary to ensure that the technology developed at the centers is transferable, suitably adapted, and useable in target areas. Investment in this activity has grown as centers have matured, and there is no reason why this may not continue, provided the projects are appropriate and in balance with the centers' research program.

All centers (except ILRAD) now conduct some socioeconomic research. In some centers much of it is separately organized and conducted. In others it is integrated into commodity and cropping systems research. Whichever route is followed, a prominent part of it is the identification of technical, economic, and social constraints to the adoption of specific new technologies in target countries. This approach, coupled with research on the consequences of adopting new technologies, has pioneered an important new field which will help to sharpen research objectives both in the programs of the centers and in the countries which they serve.

The training and conference activities of centers are vitally important to assist in strengthening national research programs. Training by centers at technical and professional levels provides scientists in these countries with highly relevant on-the-job experience and provides

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1/ From conversations of the study team with center directors.

the centers with trained cooperators in future collaborative research programs. Since the investment in training varies between centers, depending on the stage of growth, and over periods of time at any one center, it is not possible to recommend desirable investment guidelines for all centers.

> Conclusion. All of the program activities discussed are highly complementary elements in each center's program. Each center makes decisions about the balance among them in preparing its budget, but the criteria used in arriving at those decisions are seldom made explicit. It is important that the centers retain flexibility in developing center programs and the CGIAR should simply monitor shifts in emphasis and seek explanations of these rather than attempt to set firm guidelines.
>
> We conclude that each center should draft a set of criteria for its own use both in selecting research projects and in determining how much to allot to each of its other activities. Such a set of criteria would be useful in any center reviews that may be undertaken. It would also demonstrate to donors that programs are in fact determined on the basis of objective criteria in order to maintain the most productive balance among the center's activities.

Cooperation with National Programs

As noted above, cooperation with national programs, or outreach as it has been called in the past, constitutes an important and necessary component of the research programs of all centers. It extends the scope of the center's own research program and at the same time, through example and training, is helping to strengthen national research capacity.

Some of this cooperative research is carried out through frequent visits by center scientists. In other cases, formal cooperative projects are arranged with resident center scientists participating. Investment in cooperative projects of this latter type has increased as centers have developed new technologies and have acquired sufficient staff and the capability to extend to more areas.

One important feature of cooperative research is the potential it offers for centers to play a catalytic role in building a collegial network of competent national scientists. This is a dynamic process and with the strengthening of the national research capability, the opportunities for a two-way flow of ideas and technology are enhanced.

The question, therefore, is not whether cooperation with national research programs is a legitimate activity, but rather, how far centers should go in this activity. What are the boundaries, and how can these be defined in broad terms to guide centers, while allowing them to retain their flexibility to assist countries with widely different levels of development and available expertise?

In considering this question it is necessary to see the problem from a number of different angles.

Donors tend to be ambivalent about this issue. They are eager that centers not become too ingrown in their research, but they are concerned also that the centers may deploy their limited resources too widely, causing their programs to become unbalanced and their efforts dissipated over too broad a range of activities.

It is not difficult to state an appropriate principle for centers. The central thrust of each center should be to engage in research and technology development and to cooperate with national research and production programs to the extent necessary to further the center's own research activities. (Although this may be a conservative view, it leaves scope for interpretation, and centers will vary in setting their boundaries.) In general most outposted staff whose primary responsibility is in research, do inevitably become involved in some extension and production activities as a result of their normal research commitment.

The research staff in the national programs are the clients, and they do not believe that cooperation should be limited to assisting the centers' research programs. They see the centers as valuable resources they can tap to help strengthen their own adaptive research and production programs even though the centers' competence may be restricted to particular commodities.

The result of these varying viewpoints is that centers are under considerable pressure to cooperate with national programs beyond the needs required by the center's own research program. This pressure comes from the national country programs and also from the donor-agencies eager to assist programs in particular countries. In this regard, donor-members should not feel that centers have an obligation to accept such projects just because the same donor-agency also contributes to the center's central program.

Another reason for center involvement in national programs stems from some centers' belief that they have a global mandate not just with respect to research but a global mandate <u>to raise national production</u> of their particular commodities all over the low latitude world. The terminology in which the mandates of some centers are couched justifies that attitude. We believe that to be a mistake. To succeed, centers would have to become active in the whole range of necessary and sufficient conditions to increase production, described in Chapter II. If the term global mandate is to continue to be used at all, it should

be interpreted to mean global leadership among centers in research on a particular commodity or commodities. It should not be interpreted to imply a responsibility with respect to national yields or national production. Nevertheless the centers should remain vitally concerned with yield and production levels and must continuously be in touch with what is happening in farmers' fields.

In any analysis of the problem it is obvious that the technology available in international research centers is far ahead of that currently practiced in the developing world and that there is an urgent need to raise the achievement distributions of the small farmers in these countries. The centers are very conscious of this need and are anxious to help in strengthening national programs and in particular to see their technology used. However, the general strengthening of national programs requires major changes in national administrative procedures, to forge effective links between research and training research workers. Many other kinds of research in addition to that engaged in by centers are required to strengthen national programs. Moreover, the dimensions of the problem throughout the developing world far exceeds the capacity of the centers to respond. If they tried to respond they could readily be swamped with a volume of requests that would divert them from their principal and essential mandate.

Thus the problem for the centers is not the existence of this need or their obvious desire to help, but the magnitude of the effort required to bridge this gap. In approaching this problem we believe that centers should be receptive and responsive to opportunities to assist with this task, provided funds are available and their boards of trustees approve. At the same time they should be mindful of the areas in which they are adept and in which they have a comparative advantage. The extent of their involvement in cooperative programs should also be determined by the need to avoid distorting their central research thrust, the need to maintain a balanced program, and not to overreach their managerial capacity.

Our study of this problem has led to the conclusion that the definition of discrete boundaries to delineate the appropriate range of cooperative activities for a center is very difficult and probably not useful. Flexibility is needed in this respect because the appropriate boundary will vary to some extent with the type of commodity, its stage of development, the strength of the national research program, and the availability of staff and resources at the center to conduct the program.

A list of the types of activities that might be considered appropriate, sometimes appropriate and inappropriate, depending on the circumstances, are listed on the next page.

> Conclusion. We conclude that cooperation with national programs is a vital component to the research activities of all centers. As a general rule the primary purpose of such cooperation should be research to advance the central mission of the

Range of Cooperative Activities with National Programs

Appropriate

Participation in national research programs to further the centers' research mandate and to assist in the development of the national research capacity. Such activities might include:

- Evaluation of promising new breeding material for adaptation, productivity, and pest tolerance
- Two-way exchange of superior breeding lines from international and local testing programs
- On site evaluation of biological and socioeconomic constraints to farm production and studies of the consequences of new technology
- Testing key components of farming systems and evaluating farm machines suited to the needs of small farmers
- Identifying potential trainees and training trainers in research and production at regional centers or in conjunction with country programs
- Staff visits and sponsorship of workshops and conferences at regional and country centers to disseminate results and technical information

Sometimes Appropriate

- On-farm trials to demonstrate the applicability of a center's new technology
- In-country training of production personnel and advice on production systems
- Consultation on problems relating to regional or country production problems
- Assistance in the development of a national research institute involved in research and extension in a commodity or technology of direct relevance to center
- Advice on research organization staff recruitment, personnel policies and equipment

Inappropriate

- Management of national research organizations
- Participation in full time extension and delivery activities
- Management of national agricultural production programs
- Responsibility for general technical assistance projects
- Making recommendations to national governments on agricultural economic policy and related issues

center. However, centers should be alert and responsive to opportunities for additional cooperation with national programs, provided extra-core funds are available, the project is appropriate, it does not distort their central research thrust or place an undue burden on the center's administrative personnel, and the review procedures enunciated on pages 96 - 98 are met. If the project does not conform to these guidelines, the center should question its involvement and suggest that the requests for assistance be channeled to another donor or agency.

Interactions with Advanced Research Institutions

Although centers by design are primarily concerned with applied research, it must be remembered that elements of basic research are essential components of all good applied research. Without this component of basic research and the capacity to communicate and draw on relevant research findings from all over the world, centers will rapidly lose their special character and become regular field experiment stations.

Thus the question is, how can centers, while retaining their primary mission orientation and focus on applied objectives, remain actively involved in basic research to keep abreast of the latest scientific developments and serve the basic research needs of their principal crops?

Two recent developments have increased the opportunities for centers to link with relevant research programs in advanced research institutions.

One of these is the opportunity for a center to contract specific research projects that are deemed important for the progress of the center's research. CIP is making considerable use of such contracts in lieu of enlarging its own staff and acquiring the necessary equipment. Such arrangements are sometimes financed from core funds or from external sources. One donor in 1977 is designating 10 percent of its 1977 contribution to centers in the form of restricted core expressly for this purpose.

The other new development is the availability of special funds for research in North America and in Europe to support research relevant to problems of food production in developing countries. Scientists in advanced research institutions are eager to work cooperatively with the centers and several major donors are particularly keen to increase the opportunities for their countries' scientists to collaborate with the centers. The only danger with this approach might be that centers could be overwhelmed by requests for cooperation and in the process they could

be diverted from their main research purpose.

To avoid this, in any arrangements for research to be done by or in collaboration with advanced research institutions, it is important that the work be of significance to the center's program as seen by the center itself, and that there be an effective return for the investment of time devoted to the project. Centers must be protected from being swamped by requests for cooperation or for certification of projects submitted as part of an application to granting agencies. Also, they must be protected from donor pressure to undertake projects that are of little direct interest. Finally, there should be a minimum of formality and maximum contact between the scientists participating in the joint research. Opportunities for reciprocal visits and periodic reviews of programs involving staff from both the center and the external institute are important and necessary to ensure the success of such projects. It may be preferable that funding for such projects go directly to the advanced institution and not through the center, provided the above conditions are honored.

> Conclusion. Interaction between centers and advanced research institutions is important for centers (1) to sustain interest and activity in basic research in the center's program, and (2) to gain access through contracted research to the special professional qualifications and equipment resources of other research agencies. Centers should also take advantage of the increasing interest and funds available for scientists in advanced countries for research of relevance to LDCs, provided this does not divert them from their ongoing research.

Multiple Sources of Funding

Two sources of funds are available to centers. The first is those provided under the aegis of the CGIAR which are known as core funds. Their application can be unrestricted or restricted in accordance with the wishes of the donor. The other source comes in the form of bilateral contributions, obtained independently from donor agencies, many of whom are also substantial donors within the CGIAR. These have been used to fund what have been called special projects, however, in the future we propose to designate all funds from these sources as extra-core. The rational for this nomenclature is that those funds generated by the CGIAR from its donor-members are seen as the core funds of the group, either freely allocated by a center or restricted to particular projects, whereas those flowing to the centers independently of the CGIAR are categorized as outside the core funds, or extra-core.

Core funds, and to a large degree restricted core funds, because of their greater reliability, are used to support the central and critical components of each center's program. The only difference in these two

categories is that restricted core, as the name suggests, is used to fund specific aspects of a center's central program.

Extra-core funds represent a valuable additional source of funds for centers. They can be used to supplement the central thrust of the program or to finance additional activities which, nevertheless, are relevant and contribute to the center's approved goals. One of the most common uses of these funds has been to finance cooperation with national programs in individual countries.

Extra-core funds provide centers with a greater degree of flexibility in developing their programs because they can be negotiated at any time and because they provide a way of obtaining additional money from donors who may have funds available for single-country or regional projects that are not available to support the program conducted at the center. In the past, as a general rule, projects supported by extra-core funds have not been reviewed by TAC or the CGIAR.

The availability of extra-core funds can encourage centers to undertake tasks that may be inappropriate to their mandate. Centers also can be placed in a delicate position if approached by a donor with a proposal for a particular project who is also a major contributor to the center's core budget.

One of the main problems associated with multiple scources of funds is that programs have frequently become identified more with the source of funds than with the activities involved. Also, the acceptance of a large number of extra-core projects may unbalance a center's program and distort its emphasis. This same criticism could also apply to the excessive use of restricted core funds by donors. Both of these factors can also impose additional strain on the center's administration and may have long term implications for expenditures on maintenance and personnel. This is particularly relevant if the responsibility for funding these projects is subsequently transferred to the CGIAR and becomes a charge against core funds.

In the past, projects funded from extra-core sources were not reported in the program and budget proposals of centers (as of 1976 this is now done) and thus, donors were not certain how much of a center's actual program was being reported at Centers' Week.

> Conclusion. To help meet the problems caused by multiple sources of funding, we urge that each center's legitimate activities be viewed as a single integrated program, and judgments about the activities each center should undertake should be made by its board of trustees on that basis.
>
> To implement the concept, we suggest that all activities of centers be covered in their program papers, regardless of the source or sources of funds. Their

budgets should identify all sources of funds whether core, restricted core, or extra-core. All activities should be subject to the review procedures adopted by the CGIAR.

Desirable Size of Centers

Maturing centers have grown rapidly in recent years (see Chapter V) both in terms of their staffs and budgets. Because of the concern about the resources for the future, one question being asked is, how large should centers become?

Our perception about the desirable size for centers, supported by the CGIAR, grows directly out of three considerations. One is the special nature of centers' research methodology. The second is their location in developing countries. The third is the fact that there are a number of centers still to be completed at a time when the availability of additional funds is in some doubt.

The research methodology of the centers includes interdisciplinary teams of scientists tackling specific problems. For such teams to work effectively, each must be big enough to provide a critical mass of research talent and small enough to permit continuous and intimate interaction. After extensive sampling of the opinions of center directors and other experts, there appears to be a consensus that the optimum size of an interdisciplinary team varies between five and ten people, depending on the problem. The number of such teams that can be combined effectively in a single center, without losing the interaction between them, is about six.

In addition, the locations of centers in the developing world should be taken into consideration. Centers do not have a primary responsibility to assist in the development of national research programs, but because of their locations they can serve as patterns that national programs may tend to copy. Few national programs fully meet these principles of critical mass and of close interaction among scientists of different disciplines, and therefore, centers and programs of reasonable size may be a suitable pattern for national governments to follow.

Finally, for the next few years it is more important to fully develop the newer centers than it is to enlarge the budgets and programs of the older centers. Even if it is financially possible to do both, we believe that a modest amount of budgetary restraint for more mature centers has advantages. It would encourage them to consider eliminating activities that have outgrown their usefulness, and it would encourage general economy of operations.

These factors appear to be more important than the possible economies of scale that can sometimes be achieved in providing support services for larger institutions.

In many ways the number of senior scientists 1/ would appear to be a useful criterion by which to decide on the maximum size for centers, because of the central need for close interaction. That number obviously should not be the same for all centers because of differences among centers' mandates, the number of commodities involved, and the mixture of research activities undertaken. Translating such a measure into budgetary terms is difficult because of the wide differences in salaries and wage rates for research support staff, clerical staff and field workers among the countries in which centers are located. However, it is the size of centers in budgetary terms that presses on the availability of funds for all centers collectively. For these reasons both these criteria should be considered.

> Conclusion. We conclude that there is a desirable size range for centers, and that each center's board of trustees should propose to TAC and the CGIAR such a size, taking into account the foregoing considerations and the nature of its own task. That size should be used to develop a growth path for the center's budget and in turn be used as a financial guideline for determining the subsequent growth of the center.
>
> In our judgment some of the older centers are approaching a desired size. Because of the current fiscal constraints and the need to complete the development of the newer centers, the largest centers should not be encouraged to grow much further. Any significant growth beyond their present size should be questioned and accepted only after adequate justification.

Longevity of Individual Research Programs

Generally speaking, some programs of centers should be continued indefinitely while others should not.

Those which should be continued indefinitely are the programs with international implications, such as the widespread testing of promising breeding lines, the exchange and recombination of genetic materials, and the development and maintenance of major collections of important food crops.

Other activities and projects may be appropriate for centers temporarily, until national programs become competent to handle them. It is these that need to be periodically re-examined and perhaps discontinued, either because they have fulfilled their original objectives or

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1/ Senior scientists might be classified as those experienced research scientists, irrespective of their location or source of funds, who are actively engaged in research and responsible for a program or part thereof.

because they have become unproductive or redundant, or because national programs can now handle them effectively.

Up to now, new programs have been financed out of additional funding. From now on, resources for new activities should come primarily from funds that have been diverted from other activities or programs that were terminated or contracted because they did not hold strong promise of future productivity.

Most centers are still young and flexible, but they may not remain so indefinitely. Building in provisions for a periodic appraisal and reconsideration of all activities could help to ensure that center programs retain their vitality and ability to respond to new initiatives.

> Conclusion. This model of a relatively permanent center of moderate size with programs evolving and changing in response to new initiatives and research demands is the type of flexible organization we view as the most appropriate for support through the CGIAR. Opportunities to develop in this way should be built into all centers, using periodic reviews as occasions to terminate or to rejustify the continuance of particular programs.

Forward Planning and Program Development

With annual budgets and minimum resource constraints, there has been little incentive for centers to devote much time to long-range planning. Most centers conduct annual in-house program reviews, along with the development of the budget for following years, but these budgets tend to have a limited time horizon.

The need for centers to remain innovative and flexible in terms of program development has made many persons skeptical about the value of long-range program planning; however, the need for forward planning will become more urgent if centers adopt longer range indicative plans as recommended later in this report.

The only issue is the definition of the most desirable mechanism for centers to use in longer range program development. This requires that a center should begin with the planning of individual center projects or program thrusts. One of the most effective ways to approach this is to invite several independent authorities in the particular field to join the staff at the center and work together on formulating priorities and developing a realistic program for the next three to five years. It may not be necessary to review all of the centers' programs in this way. The visits should be informal and could be spread over a six month period. This approach has been used by CIP in developing priorities for individual program thrusts and has much to recommend it.

Once plans for individual program thrusts are developed and budgetary implications determined, these can be integrated into the total center program using a type of in-house review procedure. Participants in such a program development exercise should include center staff, the program committee of the board, TAC representatives and other invited participants (e.g., representatives from other centers who could make a useful contribution). If such internal program reviews were scheduled during the last year of a center's budget cycle, it would enable the center to update its existing program and extend it to cover a further cycle.

> Conclusion. All centers need to develop more effective forward program planning and development procedures in conjunction with the formulation of their long-range indicative plans. The use of independent authorities to assist the center staff in this exercise is strongly supported.

Interaction Among Centers

In recent years all centers have become more active in cooperating with national programs in developing countries. Because much of this cooperative research is concerned with commodities which are widely adapted in the low latitude tropics, it is not surprising that two or more centers may wish to work in the same region or with the same commodity in different regions. In Kenya, for example, the base for ILRAD, two other centers, CIMMYT and CIP, have cooperative programs with wheat and potatoes respectively, and ICRISAT is planning a program involving millet and sorghum. Also, with rice, IITA, CIAT, and WARDA all draw on the materials and expertise available from IRRI and in some cases draw direct support in the operation of their own breeding and regional testing programs. The responsibilities for the staff of a center involved in an inter-center cooperative program and the costs involved may be the responsibility of either center depending on the particular circumstances.

Close coordination among centers is desirable because this can have a synergistic effect on their cooperative programs. Overlapping efforts and programs related to commodities and regional activities are the natural outcome of the centers' desire to extend their research into food-deficit regions and is evidence that centers are evolving their own informal networks with respect to their commodity research.

The other important considerations in the inter-center issue are the clients, the national research organizations. Although it is important that the relationships among the centers are well organized it is equally important that they are effective in jointly serving the interests of the national research programs.

The main issues that arise as a consequence of these interactions are (1) problems of competition when centers choose to work inde-

pendently in the same region, and (2) territorial disputes that can arise concerning the major responsibility for a particular commodity in specific countries or regions.

When two or more centers are involved in the same region, regardless of the commodities, it is desirable for them to share an operational base, preferably an International Center if it is available in the region. By doing so they can maintain closer contact and avoid duplication of logistic and administrative support. Operating from a center provides the added advantage of established links with national governments, contact with other research teams, and adequate support facilities.

Where two or more centers are working on the same commodity program, as is the case with rice, maize, wheat, cassava, and chickpea, it would be desirable if the center that has been given the major responsibility for that crop were to be considered the "lead center." This would involve the responsibility for a major breeding program, collection and maintenance of a germ plasm bank, and the recombination and distribution of genetic resources for other breeding and testing programs. Other centers working with the same commodity involving regional testing or even breeding work could be designated as "relay centers." The resources and assistance provided by the lead center and the reciprocal exchange of materials and information in this type of arrangement can be very productive. The recent major increase in the yields and total production of rice in Colombia is a good example of this type of collaboration between IRRI, acting as the lead center, and with CIAT and ICA (the Colombian Institute of Agriculture) acting in a relay capacity.

The initiative to undertake such joint ventures and the details of the financial and other personnel and administrative arrangements are matters for the respective centers and their boards. Center directors should collectively identify the principles underlying the achievement of effective cooperation between centers and national programs. Territorial disputes with respect to regions or commodities that cannot be resolved by the centers should be referred to TAC for assistance and ultimately, if necessary, to the CGIAR. Finally because there is every indication that interactions between centers to assist in developing cooperative research with national programs are likely to increase, it is important that centers make formal records of these agreements and file a copy with the CGIAR Secretariat.

> Conclusion. Centers should collaborate whenever necessary in executing their cooperative research activities with national programs when working in the same region or with the same commodity. This can be enhanced by sharing the same working facilities and participating in joint research programs. Organization and administration of these informal links is the responsibility of the centers and their boards. TAC or the CGIAR should serve only to advise and assist in reaching a settlement in disputes that cannot be resolved by the centers.

Boards of Trustees

Boards of trustees are an important component in the structure of the CGIAR and an essential element in maintaining the quality and independence of centers. The principal issues that arise in connection with them are those concerned with the qualifications of the members and the criteria and procedures for their selection and appointment.

These issues have been raised in discussions with donors who express concern about the competence of some boards, and in particular, about their ability to develop realistic budgets when they do not have full responsibility for mobilizing the funds that they use. There are also some misgivings about how board members are selected, a concern that boards through their election and replacement procedures tend to become closed, and a desire to see more extensive advertising among CGIAR members regarding forthcoming board vacancies.

In raising these issues, there is no reflection on the quality or effectiveness of any of the boards; in fact our general impression is that they are performing a valuable role in conjunction with the director and his staff in developing and reviewing the programs and budgets of the centers.

Because of the need to maintain the autonomy and freedom of boards and their critical role in planning and decision making, it is important that each board define its own guidelines for the selection and appointment of members. These might include:

(1) Personal competence, and professional understanding of the field.

(2) Balanced representation of expertise in relevant scientific discipline, research management, business experience, and familiarity with the problems of developing agriculture.

(3) Members, with the exception of those representing the host countries, elected not as national representatives but as members in their own right to ensure the nonpolitical character of the board. In making such nominations, the candidates' governments should be fully informed to ensure cooperation.

(4) Host country and *ex officio* membership kept to a minimum. Foundations and aid agencies should not be given reserved seats on boards, although it is hoped that the invaluable professional contribution of these organizations will continue to be available through membership on boards.

(5) More effective donor participation achieved by having on each board at least three members selected in conjunction with and ratified by the CGIAR. Older boards that do not have this provision may have to move slowly in this respect because of the legal and constitutional obstacles in the original charters of these centers.

(6) Boards should thoroughly canvass all CGIAR members, LDC countries, and pertinent research organizations before selecting new members. Lists of potential candidates could be maintained by the CGIAR secretariat. The boards and the CGIAR (when appropriate) should be given ample time to consider candidates before making recommendations.

(7) Staggered appointments are recommended to avoid loss of continuity and to avoid any tendency to become closed. A fixed term of office is desirable (three years is suggested) with the provision that no member can be elected for more than two consecutive terms.

Conclusion: Boards of trustees are of central importance in the development and planning of center programs. Each board should define its own criteria and procedures for the selection and appointments of boards members. It would be appropriate for those boards without CGIAR representation to broaden their membership by their inclusion.

Staffing Issues

The reputation and success of the CGIAR and its individual centers is largely a reflection of the motivation, vigor, and high caliber of the scientific staff, the excellent facilities and working conditions at the centers, and the enlightened personnel policies that have helped bring this about. It is essential that these be maintained to attract and retain good scientific staff since they collectively represent the organization's most valuable resource. It is also important that the centers have access to good leadership, and ways to develop this potential in the younger staff members should be explored.

Although the general conditions are good, there are some issues that require consideration in the interests of improving conditions for existing staff and also to ensure that the centers continue to retain an advantage in attracting new staff of the highest quality.

Most of the issues listed here are matters that are the direct concern of center management, and as such are outside the purview of the

present review. The only justification for including them is because any matter that influences the performance of a center is also inevitably the concern of the CGIAR.

(1) Many senior scientists claim that they have little opportunity to publish in reputable international journals because of the nature of their research commitment and the time constraints under which they work. This limitation has had a negative influence on the recruitment of younger scientists and can restrict the ability of center scientists to re-enter national research institutes and universities in developed countries.

(2) Some outposted staff, especially those appointed to cooperative country programs on extra-core funds, lack any form of tenure and often feel insecure. Also, under present policies, they have few opportunities to return regularly to the center to exchange scientific ideas and information. They tend to feel isolated from the mainstream of center activities.

(3) Although the scientific staff at most centers are still young and highly motivated, every research institution ultimately faces the problem of aging staff. This might be avoided by continual investment in postdoctoral students and sabbatical visitors, regular sabbaticals for senior scientists, including outposted staff regardless of source of funds; greater opportunity for center scientists to transfer to other centers and obtain renewed stimulus from new problems; rotation of staff from LDCs to share the experience of working in International Centers; and more active interfacing with basic research programs in advanced research institutions to maintain a strong scientific competence in the center's program.

(4) The disparity in salaries and working conditions of scientists at the centers, in comparison with other scientists living and working in these same countries, presents a problem which is not restricted to the CGIAR centers. All centers are well aware of this and have attempted to reduce the visible disparity in living standards. Despite these problems, it is essential that incentives be maintained to attract talented scientists and their families to live and work in LDCs.

(5) Recruitment policies for centers should be made more open and every opportunity should be taken to identify

new staff from the widest possible cross section of potential applicants.

Conclusion. All of these issues are germane to the central problem of the quality and performance of center staff, and for this reason they should be treated as a matter of high priority by center management. The periodic meetings of center directors provide an appropriate forum for the discussion of these and other issues of common concern such as length of tenure and perquisites. Specifically, attention needs to be given to the issues of open recruiting, maintenance of the vitality of staff, and sabbatical privileges of outposted staff.

VIII. PLANNING, EVALUATION, ALLOCATION, AND MANAGEMENT FOR THE CGIAR AND ITS FAMILY OF ACTIVITIES

The CGIAR has experienced rapid growth and change over the past five years. Five new centers plus two additional activities have been added; budgetary costs have increased fourfold; and the number of donors has nearly doubled. This growth has occurred within the formal structure of the CGIAR with minimal problems. The next three to five years promise to be a period of further growth. The newly approved centers will be crystalizing their programs, older centers will continue to adjust their programs to changing needs, and as projected in Chapter VI, financial requirements will continue to grow. Thus, the basic question is whether any changes in the CGIAR's structure or mechanisms for planning, evaluation, allocation, and management should occur. Our analysis of this question is divided into five topics: (1) structure of the CGIAR, (2) mechanisms for long-range planning and evaluation, (3) mechanisms for budget planning and development, (4) mechanisms for budget allocation including the distribution of shortfalls, and (5) technical and management needs of the CGIAR.

Structure of the CGIAR

The overall structure of the CGIAR necessarily came within the purview of the review. In looking at it, the question was asked whether any major changes were necessary.

The "structure" of the CGIAR has the following characteristics: (1) it is a consultative group made up of independent donors who in the final analysis make individual allocative decisions regarding distribution of resources to centers and related activities, (2) it supports independent research institutes, constituted under national law with international boards of trustees, (3) it receives its technical advice from an independent Technical Advisory Committee (TAC) composed of internationally recognized scientists and science administrators from both developed and developing countries, (4) membership in the CGIAR is gained mainly by participating as a donor, (5) acting through group consensus, it makes rules for its own conduct as it deems appropriate, and (6) its administrative functions are provided by two secretariats.

Two of these structural characteristics, donor independence and center independence, represent an inherent contradiction if both are pursued to the extreme. To date the CGIAR has operated by pragmatic modifications of these characteristics to avoid irreconcilable differences. Our conclusions and recommendations seek mechanisms which retain as much of this independence as is consistent with effective operation of the CGIAR and minimizes bureaucratic formalization as the solution.

The only structural issue arising is the need for more effective participation in the affairs of the CGIAR by users and potential beneficiaries of CGIAR research. The provision for regional representation on the CGIAR offers one opportunity. In addition representation on TAC and Center Boards provide other opportunities. Finally, if the forum activities recommended in this report are implemented, this mechanism can be used for increased participation. It is our judgment that if all of these avenues are fully utilized, the desired objectives would be achieved.

> Conclusion. No basic changes should be made in the CGIAR's structure, including the composition of its membership. However, several changes in mechanisms employed within that structure are needed and are addressed in subsequent sections.

Evaluation and Long-Range Planning

The CGIAR has relied on TAC for advice on both the future directions of the CGIAR and for evaluation of ongoing activities. To date, TAC has dealt predominantly with proposed initiatives in a sequential fashion, however, always within the context of the priorities as stated in the TAC priorities paper. Evaluation of ongoing programs has begun recently through the initiation of quinquennial reviews. The basic issue is whether these procedures are sufficient to maintain continuing surveillance of future needs and current activities in an integrated fashion within the broader context of food needs.

If the conclusions of this review about the number and size of centers are accepted, then in the future the balance of CGIAR activities will shift more toward maintenance of already approved activities. Thus a mechanism which provides for a periodic overview of the family of CGIAR centers, can identify new needs, monitor gaps and overlaps in CGIAR activities, can establish fiscal requirements and availabilities, and assign priorities within and between programs is very important. Our analysis is that, to date, TAC has done a good job in its assigned tasks and we see no reason why TAC cannot continue to provide similar services to the CGIAR.

It may, however, be appropriate to spell out in more detail the mechanisms TAC might use to maintain an overview of the activities of the CGIAR family in the broader context of food research needs. These mechanisms are: (1) review of proposed initiatives, (2) quinquennial reviews, (3) "stripe" analysis, (4) review of indicative plans of centers, (5) periodic priority reviews, (6) continuing interaction with center programs.

TAC should continue to play the major role in reviewing proposed initiatives. These would include completely new proposals that could involve establishing new research activities and reviews of new

or large initiatives within existing center programs. All new or large activities being proposed by centers, regardless of the source of funds, should be reviewed by TAC regarding their appropriateness to the center mandate, implications for administration, and implications for future commitment of CGIAR resources.

The quinquennial reviews initiated this past year show much promise. With experience it may be appropriate to sharpen the definition of the purpose of the reviews. The reviews should be concerned with three principal tasks: (1) to evaluate the scientific quality of current programs, (2) to comment on the scope and balance of current programs, and (3) to evaluate future plans including the explicit review of center proposals to continue projects of long standing. Clearly, the onus should be on centers to justify continuance. This latter function of reviewing future plans is particularly important for TAC and the CGIAR. The quinquennial reviews should be planned well in advance, giving the TAC time to establish a high quality review committee which can be briefed well in advance and allow centers time to carefully develop their long-range future plans. The reviews should be analytic and probing in their treatment of programs, particularly regarding the relative distribution of efforts within center programs. A concise summary of the report should be prepared for the CGIAR. To date, reviews have tended to focus on current programs and generally have recommended more of everything. In addition to these main areas of investigation, common to all centers, specific questions for review could be posed by TAC, the CGIAR, or individual donors.

TAC should continue periodic across-center analysis of particular internal program components such as training, documentation, cropping systems research, etc. These "stripe" analyses would be useful to TAC and the CGIAR in maintaining an overview of the system and also would provide a useful mechanism for centers to compare their different program components and learn from each other. They are termed analyses rather than reviews because we would not like to see them become mechanisms that encourage conformity.

In the next section, a longer term budget cycle is proposed including two-year (biennial) budgets and an additional two-year indicative or perspective program plan. TAC's role would be to review the indicative plans in the context of budget proposals, modify them if necessary after discussion with the centers and recommend to the CGIAR for approval the center's budgetary growth path. Each center would develop its next biennial budget within that plan.

Using the above procedures, TAC in time could be in an excellent position to reassess the program of the CGIAR periodically (every five years) and to recommend priorities for the future.

Finally, TAC needs to have members who are knowledgeable about particular center programs. One possible approach TAC may want

to consider would be if subsets of TAC members were specifically responsible for knowing about particular centers. If TAC member A were assigned specific responsibilities for centers 1, 3 and 5; B for centers 1, 2 and 4; etc., then three members of TAC would be particularly familiar with three centers, but no two members would have common responsibilities for more than one center. TAC members could develop this knowledge by attending in-house program development reviews and possibly participating in quinquennial reviews.

The redefinition of TAC's role apparently implies an expanded set of responsibilities. However, TAC is already involved in priorities, quinquennial reviews, stripe analysis, reviews of proposed initiatives, and reviews of center budgets. With effective staff work from more closely coordinated secretariats, we believe the task is manageable.

In addition to reviews undertaken by the TAC, there is need for periodic review of the overall CGIAR program and of the mechanisms and management of the CGIAR by the CGIAR itself. The current approach of constituting a review committee within the CGIAR has merit. A similar review should be conducted within three to five year intervals. The review committee could have the option of commissioning a study team or teams, if it saw the need. TAC's recommendations on future program priorities would be a major input into that review.

> Conclusion. We conclude that TAC with an appropriate redefinition of its role should provide the mechanism for continuing review of ongoing programs in the context of changing broader needs. TAC should be asked periodically (every five years) to produce an updated broad program perspective for the CGIAR. This review as a part of a quinquennial review of the CGIAR itself would provide adequate mechanisms for long-range planning and evaluation for the CGIAR and its family of activities.

Mechanisms for Budget Planning and Development

The preceding section discussed the need for and proposed mechanisms for long-range forward planning in conjunction with substantive reviews of ongoing programs. There are also intermediate-term planning issues related to budgetary forward planning for centers. These plans have implications for total CGIAR financial commitments. At the moment, financial arrangements are made mainly on an annual basis between donors and centers. The basic issue is whether or not there is a need for better intermediate-range budget planning and development.

We are convinced that the annual budget process, in the absence of regular, comparative formal consideration by the CGIAR of longer range plans of centers will constitute a critical problem in the

future, particularly if resource shortfalls occur. The centers are long-term research institutes that must in their internal operations look further than one year ahead. Therefore, to assure greater resource stability over a long period some mechanisms seem needed as far as centers are concerned. Many centers and their boards have developed, for their own planning purposes, longer range program plans using different approaches and time horizons. However, analysis suggests that the three-year projections now made by the centers lack reality. The conclusion is reached by comparing both actual budget requests in subsequent years with previous projections and by evaluating 1977 program and budget projections to 1980. Most of these are completely static with only variable allowances for price increases included. It would be in the centers' interest (as well as the CGIAR's) to have longer range budgets. Discussions with centers suggest a receptiveness to longer term budgets provided that they are used in the allocation process. This would require that centers develop an improved capacity to do long-range planning.

Discussions with donors also led to the conclusion that many donors would prefer longer range plans even though some donors may not be able to commit resources beyond one year. All donors would like, for planning purposes, some longer range perspective of potential financial demands of the CGIAR supported activities.

We have reviewed approaches to longer range budget planning used by some other research institutions and find persuasive arguments for considering at least two-year budgets, with indicative plans for an additional two years. If centers were asked to use the concept of a maximum desirable size (discussed in Chapter VII) as a beginning point, realistic biennial budgets, plus additional two-year indicative plans, could be developed.

Projections for the second two years would necessarily be more general, but could identify future staffing needs, proposed major adjustments in programs, anticipated major capital needs, requirements for equipment replacement and such other major changes as the expansion of regional activities that the center contemplates.

> Conclusion. Each center should be asked immediately to define its desirable size and then to use that size in developing a biennial budget and a further two-year indicative plan. The biennial budget and the indicative plan, after analysis by the secretariats and review by TAC, in consultation with the centers, would serve two purposes. First, it would constitute a formal budget proposal to the CGIAR and, second, it would provide a framework (budgetary growth path) within which the centers' next biennial budget could be prepared. A necessary component for such a plan would be an explicit and reasonable system for centers to define and forecast

price increases.1/

Some donors cannot commit funds beyond one year. However, there is nothing inconsistent between annual pledges and biennial budgets. If after some experience with biennial budgets and two-year indicative plans they work well, then triennial budgets might well be considered. If half of the centers were budgeted each year it would equalize the work load for TAC, the secretariats, the CGIAR, and the centers, and would perhaps allow for more meaningful interchanges at Centers' Week on past program performance and future plans.

Mechanisms for Budget Allocation Including the Distribution of Shortfalls

The particular character of the CGIAR creates two potential problems that would not occur in a centralized or hierarchical, unitized organization. These are: 1) the potential for between-year instability in center support resulting from a large number of independent fund sources, and 2) the absence of a formal decision-making mechanism to allocate resources among CGIAR activities. The latter issue becomes very important if resource shortfalls occur.

The problem of between-year instability could occur even if total resources available were sufficient to meet total budget requests, if some centers were oversubscribed and others undersubscribed and if the donor of last resort chose not to make up the difference. However, the problem would become more serious if an overall shortfall did occur. For long-term research institutions to have to depend on 20 or more donors for resources pledged, on an annual basis, late in the previous year, poses potentially serious problems of instability. This potential instability results mainly from annual provision of funds by donors but the centers' dependence on a multitude of independent donors also contributes to the instability. That element, however, has additional potential implications in periods of shortfall, when the donor of last resort cannot cover the deficit. With complete retention of donor autonomy, some centers could, when the columns are added up, suffer severe budget cutbacks on short notice, and thus be incapacitated. At the other extreme, other centers might receive more support than they really require.

If the CGIAR is going to adopt longer range planning for centers, it is reasonable that it adopt some minimal policy guidelines that would give longer term stability to program funding.

1/ The definition and application of this system to deal with inflation is an appropriate task for the CGIAR Secretariat.

Conclusion. It is our conclusion that donor autonomy with the following modifications be retained rather than resorting to a pooling arrangement. Donors should be encouraged to accept the following guidelines: (1) that donors designate a portion of their contribution as flexible or unspecified funds; (2) that when donors undertake support of a center they accept an obligation longer than one year; (3) that donors provide two years' notice before discontinuing support of a center or one of its activities; (4) that donors agree to cooperate so that no center or activity is overfunded, including supplementary requests; and (5) that the donor(s) of last resort should fund a seriously underfunded center, but if that situation persists for two or three years, the future of the center should be reviewed by the CGIAR.

The second problem relating to resource allocation stems directly from the consultative nature of the CGIAR composed of many autonomous donors. The problem is that no mechanism for making collective budget decisions exists. Given that we have recommended that the character of the CGIAR be retained with modification, a binding mechanism for decision making is not recommended. However, it is clear that some mechanism for collective advice should be available in the event shortfalls occur.

A standby committee of the CGIAR should be authorized to give such advice. The committee is proposed as "standby" because it is our judgment that if growth paths are well defined within the limits of potential resource availability, and if the guidelines on donor behavior suggested previously are adopted, the likelihood of annual shortfalls will be minimized. In the event a shortfall is likely, the committee should be called on to recommend a course of action to the CGIAR. The following guidelines could be followed: in the event of a shortfall the lowest priority should be given to capital requests of mature centers that can be deferred; requests for additional funds for new program proposals at mature centers; and significant additions to original plans at maturing centers. If the reductions implied by these guidelines are not sufficient to cover the shortfall, the committee should review center budgets and make recommendations for adjustments, recognizing the stage of development at maturing centers and the need to maintain ongoing activities of all CGIAR activities. To the extent that donors, in addition to the donor of last resort, designate portions of their funds as flexible, the advice of the standby committee could be used in the allocation of these flexible funds.

It is appropriate for donor representatives to be involved in the proeess of budget reduction. Further, increased participation of donors in the direct affairs of the CGIAR would be useful to sustain donor commitment. The alternative would be for TAC to be the primary budget advisor. Because of the expanded role assigned to TAC, the additional work load would be difficult to handle. More important, TAC's main role

should be forward program planning and program evaluation. Further, it is our judgment that to mix the roles of scientific advisor and fiscal decision maker is not necessarily desirable. TAC and the two secretariats would provide invaluable analysis and input to the committee. In the following section a mechanism for this is proposed.

The existence of a committee of this sort would also provide a possible mechanism for the CGIAR, or the chairman of the CGIAR, to use if other pressing policy issues arise.

> Conclusion. A standby committee of the CGIAR should be established to consider and give advice on center budget requests in the event of a serious shortfall. Its membership should include the chairman of TAC and the Executive Secretary, as well as other members that the CGIAR might designate. Having the chairman of TAC on the committee is a mechanism to get a TAC input without formally involving TAC in short-term fiscal issues. The committee could also be called on for advice on such other policy issues as deemed important by the CGIAR.

Once the allocative decisions are made on the basis of donor allocations with advice from the committee, TAC and the CGIAR Secretariat, the allocation of budget shortfalls within each center or other CGIAR activity should be the responsibility of the board of trustees and the director-general.

Technical and Management Needs

In this section two topics are discussed. These are: (1) the staffing and budgetary analysis requirements of the CGIAR and TAC, and (2) the problem of cash flows.

Despite the preceding conclusions that the informal nature of the CGIAR be preserved, there are administrative and analytic functions that must be performed. Currently, these functions are provided by two separate secretariats -- the TAC Secretariat attached to FAO and the CGIAR Secretariat provided by the World Bank. Increasingly, donors are requesting integrated program and fiscal analysis both of current budget requests and of longer term financial needs. The Integrative Reports and center commentaries are useful documents as far as fiscal and budgetary matters are concerned. Similarly, the TAC minutes and the TAC chairman's reports to the CGIAR are useful inputs as far as program content is concerned. Both suffer from the deficiency of focusing on only a part of the total picture which encompasses both program and fiscal issues.

When the two secretariats were initially established, it was to draw upon the technical and professional skills of the two organiza-

tions concerned (FAO and IBRD), despite obvious inconveniences of having separate staffs.

Implementation of the recommendations of this report will require closer coordination between the two secretariats and a functional integration of some of their work. This closer cooperation is essential if the two secretariats are to serve the Group effectively, and the situation should be watched carefully to ensure that it takes place.

The TAC and CGIAR secretariats exist to serve the needs of the CGIAR and its agencies. Their independence and integrity are critical in assuring donors of effective use of their funds. It must be clearly recognized that the secretariats exist to serve the Group and that they report to the Group through their respective chairmen. To fulfill all their functions, including reviews, the secretariats must be adequately funded and staffed. It is in the Group's interest to assure that the funding and staffing requirements of the secretariats are adequately met. Therefore, an annual report of the proposed budget and staffing for the secretariats, accompanied by a statement from the co-sponsors about their capacity to support the secretariats is needed. In the event the co-sponsors cannot fund the full needs of the secretariats, donors should be prepared to make the necessary funds available.

Given the urgency of this issue, the co-sponsors should report at the meeting of the CGIAR in October 1976, as to whether they foresee difficulty in meeting these obligations.

> Conclusion. The effective review of current (biennial) program and budget proposals of centers and related activities requires integrated fiscal and program analysis, particularly as it relates to significant changes and trends in budget proposals. This will require coordinated inputs from TAC and its Secretariat and the CGIAR Secretariat. The Group should ensure the functional integration of the secretariats and their adequate support. It must also be agreed that the secretariats report to the Group through their respective chairmen.

The final management issue discussed is that of short-term funding difficulties. Multiple sources of funding and varying fiscal years are creating very serious short run cash flow problems for some centers. The cash flow problem primarily results because some donors provide funds late in the fiscal year causing early year cash flow problems for some centers. The most obvious and easiest solution is for donors to make their contributions earlier. Failing this, better information about when funds will actually be provided would also help. The CGIAR Secretariat could make this information available to the donors or centers. If this is not sufficient, an option to seriously explore is asking the World Bank (IBRD) to handle it, perhaps by rotating its residual contribution among cash short centers prior to final allocation. In our judgment, independently expanding working capital at each center or creating a separate fund to meet cash flow problems are both inefficient and unnecessarily complicated.

Conclusion. The cash flow problem is serious and needs attention. The easiest solution would be for donors to provide their funds early in the fiscal year. Failing this, alternative solutions need to be sought.

ANNEX

WORLD FOOD NEEDS:
FOOD GAPS AND PERFORMANCE

Prepared by

Nathan M. Koffsky

Report to the CGIAR Review Committee Study Team
Washington, D.C.
May 1976

Report to the

CGIAR Review Committee Study Team

Findings and Implications for Research

In many countries of the developing world, performance in food production lags seriously, building up food shortfalls which could well become unmanageable. Thus, there is an urgent need to improve yields in most of the array of food crops as soon as possible. The findings which surface from this report suggest certain guidelines for directing attention as to research needs and priorities in terms of specific areas and specific food crops.

1. There is a clear case for urgent attention to the needs of the low income countries (i.e. GNP per capita less than $200) where large food shortfalls threaten over the next decade and beyond. Most importantly, these include India, Bangladesh, Indonesia (probably) , Nigeria and most other low income Sub-Sahara Africa countries. This group also contains most of the malnourished people in the developing world. Food crop yields are generally low and performance in improving them is poor. This is especially a matter of concern in Asian countries where additional cultivable land is a constraint.

2. Next are those countries, somewhat better off economically and in food production, but which also face substantial food deficits and financial constraints to purchase

needed food supplies. These include the rest of the Sub-Saharan countries, the non-OPEC North Africa/Middle East countries, the Mid-America/Caribbean group (except Mexico) and the Andean countries of South America, especially Peru and Bolivia.

3. This does not mean that others, where improved crop yields are a major determinant of higher incomes and levels of living should be denied attention. But the major focus should be directed to the groups above if the food problem in developing countries is to be resolved.

4. While attention should continue directed toward improving yields of the major cereals - rice, wheat and maize - there is need also for emphasis on millets and sorghum which are associated with the dry land cultivation prevalent in many food deficit countries. The same is true for root crops and for pulses and groundnuts.

5. In Asia, the primary need continues to be improvement of rice yields, the major food. Performance in this respect appears to be more or less adequate only in Pakistan and Indonesia. In India, additionally, poor performance in sorghum, millets and pulses also contributes substantially to the food problem. In Indonesia, where cassava is important, yields are on a declining trend. The situation for maize and groundnuts is generally unsatisfactory throughout the region.

6. In Sub-Sahara Africa, yield performance of the major cereals - maize, millets and sorghum - is poor, particullarly for the latter two where yields are declining. Root crops - cassava, yams and sweet potatoes - which rank with cereals as a major food source in much of the region, are having difficulty in maintaining historical yield levels. Yields of pulses and groundnuts are on a declining trend.

7. In North Africa/Middle East, the major problem in food crops remain wheat and barley, although in the low income countries of Sudan, it involves sorghum, cassava and pulses, and in Afghanistan, millets as well as wheat.

8. In Latin America, where maize is the dominant food, the main problem countries are in the Mid America/Caribbean area (except Mexico) and in Bolivia and Peru. Maize yields in the former group have not changed much in the past and have risen only slowly in the latter two countries. Cassava and sweet potatoes are important in Haiti (a low income country), but yields show no significant change historically. In Bolivia and Peru, yields of wheat are low and declining in the latter country. Yields of potatoes in Peru are low and also show no tendency to improve. In most of Latin America, production of pulses lags behind population growth.

9. It should be noted that there is an immediate and urgent need to improve food production in low income food deficit

countries. This places added emphasis on accelerating and exploiting research on those commodities where the potential exists to make a significant impact in the next 5 to 10 years.

10. At the same time, it is recognized that there are other constraints - inappropriate food policies, lack of incentives, inadequate institutions and management, lack of inputs, etc. —which impede the adoption of available research and technology by the ultimate cultivator. To narrow this gap, more intensive research is needed to identify and to help overcome such constraints.

Introduction

This report is designed to provide background information on potential food shortfalls in developing market economies[11/]; to sort out the countries and regions where the food problem is likely to be most difficult, and to identify the principal food crops which require attention if food needs are to be met.

Food shortages and poor performance in crop yields and production may reflect many constraints. Whether inadequate agricultural research either at the international level or in the national research system is a major factor does not come out of the analysis in this report. Rather it provides a framework in which to look in order to determine if that is the case in particular situations. To get closer to such an evaluation,

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11/ This excludes the Peoples' Republic of China and other Asian

it might be well to mobilize the expertise in the International Centers to determine if the varieties being developed and the directions of research are in accord with the specific agro-climatic and other requirements in the areas of greatest need.

Essentially, the food problem in the developing world is largely one of cereals. Generally, cereals provide the major source of calorie intake (Table 1). Further, recent findings suggest that consumption of enough cereals to satisfy minimum energy needs will provide enough of the other nutritional requirements as well. Thus, for most developing countries, particularly low income countries, the potential cereal deficit is a meaningful measure of their food problem.

Attention is also given to the starchy root crops. In Indonesia, Sub-Sahara Africa and South America, root crops are an important alternate source of energy. While experience indicates that over time cereals come to be preferred because they require less bulk to provide equivalent calories and are higher in protein content, root crops will continue as a substantial part of the diet, especially for subsistence cultivators. In these regions, a lag of root crop production relative to population growth would increase the requirements for cereals.

Similarly, production performance of pulses, soybeans and groundnuts - major sources of vegetable protein - is evaluated. In most low income countries, vegetable protein is much more important in the diet than animal protein. Meat becomes important in the diet in higher income countries - beef in beef exporting countries of Latin America, pigs in Asia and sheep and goats imported

into Near East OPEC countries largely from Sub-Sahara Africa. These are not considered in this report since they are of relatively low priority in directly meeting overall food needs although they might well be important elements in development strategy in some countries, especially in Africa.

The Cereals

Cereal Deficits - 1985

Projections of the cereal deficits for 1985 (table 2) used in this report are those of the International Food Policy Research Institute. [1/] This is the only set of published projections which provides a complete breakdown of the incidence of cereal deficits by major countries and regional groupings. [2/]

The methodology for projecting the deficit employed by IFPRI, and used as well by FAO and the World Bank, basically involves projecting the gap which results from demand for cereals arising from population and income growth on the one hand and on the other projecting the historical trend of cereal production. Thus, the deficit indicates the amount which would be needed to satisfy demand for cereals if past production trends continued into the future.

1/ Meeting Food Needs in the Developing World: The Location and Magnitude of the Task in the Next Decade. Research Report No. 1, Washington, DC, February, 1976.

2/ Projections for a number of countries have been made by FAO and the World Bank for internal use. In general, those projections using approximately the same methodology as IFPRI yield about the same results. The major exception is Indonesia where FAO data indicate a much smaller deficit than the IFPRI projection which was based on USDA data. Other projections prepared by OECD, the Univ. of Calif., and Iowa State Univ. were not usable for various reasons, mostly because of lack of comparability in coverage of countries.

Such projections indicate the extent of adjustments countries face: whether to meet deficits by increased production, by commercial imports if foreign exchange is not constrained, or concessionary imports if it is; and/or by reducing per capita consumption either by higher prices or by rationing.

The ranges in IFPRI projections of consumption and cereal deficits are based on a high income growth assumption (more or less the historical trend in growth in GNP per capita) and a low income growth assumption which takes into account the slowdown stemming from the energy situation in many developing countries. Further, the countries were categorized according to their economic circumstances into three income groups; low income, middle income, and high income.

Table 3

Gross Cereal Deficits by Income Groups

(million tons)

Food Deficit Countries	1969/71 Ave.	1974/75 Ave.	Projected 1985/86 High Income Growth	Projected 1985/86 Low Income Growth
Low Income	5.4*	12.6*	48.0	41.9
Middle Income	10.9	17.1	25.2	22.9
High Income	9.3	13.0	34.8	29.7
TOTAL	25.6*	42.7*	108.3	94.5

*Does not include deficits for Pakistan and Brazil which are projected to become exporters by 1985.

Low Income Food Deficit Countries

As noted in Table 3, the major cereal deficits are in the low income countries (i.e. those with less than $200 per capita in 1972). These include the South Asian Countries, Indonesia, a few in North Africa/Middle East, and a large number of Sub-Saharan countries.[1/] They are expected to contain about 1.5 billion people in 1985, some 60 percent of the total population in DME countries. Population growth is the main factor increasing food consumption. Their cereal crop yields are lower and rising more slowly than in the Middle Income Group, and generally are more subject to weather and other uncertainties. These countries have little option except to increase production more rapidly, inasmuch as the size of the deficit appears to be beyond the bounds of either commercial imports of food aid transfers. Further, since in most low income countries average diets are already deficient, there is little room for downward adjustment in that regard which generally would impact most severely on the poor who already are underfed.

According to FAO, some 440 million people, most of whom are in Asian low income countries, are underfed. If things go on as they are, their numbers will increase by 1985. FAO estimates that an additional 20 million tons of cereals, beyond the deficit shown for 1985, would be required to supplement their intake by 250 calories per day. This may be conservative. Other estimates place the additional requirement at 35-40 million tons.

1/ See Annex's A and B for countries included and expected population in 1985.

Middle Income Food Deficit Countries

This group (per capita GNP above $200) includes the Philippines, Egypt, Turkey, most non-OPEC countries of North Africa/Middle East, some Sub-Sahara Africa countries containing about 1/6 of the region's population, and Latin America excluding Argentina and Brazil. In total, these countries contain about 20 percent of the population in DME countries. In recent years, the cereal deficit for this group has been larger than those for the other income groups but is projected to increase more slowly in the future than the others. While they are generally in a better position than the low income group, chronic food problems exist in Egypt, much of Mid America/ Caribbean area and the Andean countries of South America.

High Income Food Deficit Countries

These countries have a high capacity to generate foreign exchange. They include the OPEC countries and diversified economies in Asia such as Taiwan and South Korea. With high income growth the demand for cereals, particularly for feeding livestock, rises rapidly. While the cereal deficit will increase rapidly, they have the resources to import commercially. Their population is only 8 percent of the total.

Cereal Exporters

Presently Argentina and Thailand are significant exporters. The projections indicate that Pakistan and Brazil will move into that category within the next 10 years. Population in these countries will account for 13 percent of total DME population at that

time. While cereal production for this group generally increases at a satisfactory rate, most of it comes from expansion of crop area in Thailand and Brazil whereas rising crop yields is the major factor in Pakistan and Argentina.

Cereal Deficits by Countries - 1985

The Secretariat of the U.N. World Food Council has identified those developing countries which it considers as Food Priority Countries. For the most part, this group substantially is in accord with the category of low income food deficit countries noted above. (It should be noted that Burundi, Togo and Zaire which are not listed under Food Priority Countries are in the opinion of the Secretariat at the margin and could well have been included.) Table 4 shows the upper end of the range of the deficits projected by IFPRI for Food Priority Countries as well as for all other countries. The accompanying data for each country on rates of growth in area, yield and production of cereals are from FAO.

Speculation on 1985-2000

According to U.N. medium projections, population of DME countries will increase from 2.5 billion in 1985 to 3.6 billion in 2000. The rate of population increase will slow in Asia, North Africa/Middle East and Latin America but is expected to increase slightly in Sub-Sahara Africa. Under an assumption of maintaining grain consumption per capita constant from 1985 to 2000 1/ and

1/ This assumption would still leave most of the low income countries with inadequate cereal intake per capita

continuing the past production trend, the cereal deficit would increase by 30-35 million tons over 1985. Under such assumptions, which are only suggestive, the deficit in Asia would stabilize, increase slightly in Latin America, and rise substantially in Sub-Sahara Africa and North Africa/Mid East where population would outrun cereal production by substantial margins.

Under a more realistic assumption that incomes will continue to grow and add to demand, the total cereal deficit could well double between 1985 and 2000, reaching 200 million tons or more.

Performance of Cereal Crops - 1961-74

In order to determine the particular food crops in specific countries where performance needs to be improved, historical growth rates (1961-74) of area harvested, yield per hectare and production have been computed from data published by FAO for 6 cereals (wheat, rice paddy, barley, maize, sorghum, and millets), 4 root crops (cassava, yams, sweet potatoes and potatoes) and pulses, groundnuts and soybeans.

As can be seen in Tables 5 and 6, yields of all the grains are significantly lower in the low income food deficit countries than in the middle income group, and increases in yields have come at a much slower pace. Performance in the high income group is mixed with high yields of rice (paddy) in Asian countries such as Taiwan and South Korea and very low yields of wheat in OPEC countries of North Africa/Middle East. For food exporters, yields of maize average significantly higher but those of rice and wheat are relatively low. Increases in production in the exporting group have

come more from expansion of crop area than from yield increases.

Asia: Excluding the high income group, crop yields of rice - the major cereal in the region - have risen rapidly in Pakistan, Indonesia, the Philippines and Sri Lanka. They have lagged badly in Bangladesh, Thailand, Nepal and Burma. Yields in India have risen somewhat less than average. For India, Bangladesh, Nepal and Burma, there has been little growth in paddy area, indicating that in the future increases in production will have to come from higher yields per hectare.

Performance in wheat has been good in India and Pakistan, the main countries involved. For millet and sorghum which are important in dry areas of India, yields are low, rising for millet but not for sorghum. In the major countries concerned with maize - India, Indonesia, Philippines and Thailand - yields are less than 1 ton/ha except for Thailand, which exports most of its maize. Yields have risen significantly only in the Philippines.

Thus, the major concerns which come out of these data are to improve more rapidly yields of rice in India, Bangladesh, Nepal, and Burma; with Thailand close behind; yields of millet and sorghum in India; and yields of maize in India, Pakistan, Indonesia and Thailand.

North Africa/Middle East Non-OPEC: In this region, wheat and barley are the most important cereals, with additionally sorghum in Sudan and millet in Afghanistan, both low income countries.

In Egypt, where the land is largely cropped and irrigated, crop yields of wheat, rice and maize are about the highest in the developing

world. While wheat and maize yields have increased rapidly in the past, it seems unlikely that this will continue unchecked. In Turkey, where crop area is also limited, yields of wheat, barley and maize are somewhat above average, and increasing for wheat and maize but stagnant for barley.

For the rest of the higher income group - Jordan, Lebanon, Morocco, Syria, Tunisia and Cyprus - yields of wheat and barley are somewhat lower than in Turkey and in most countries the area of grain is declining. Except for Morocco and Tunisia, barley yields show a substantial downward trend, and for wheat, the trend in yield is slightly down.

For the low income countries, wheat area is expanding rapidly in the Sudan but yields are declining. To a lesser extent the same situation prevails in sorghum. In Afghanistan both wheat area and yield are rising slowly, but millet yields are declining.

As a matter of priority for low income countries, special attention should be given to reversing the downtrend in yields of sorghum in Sudan and of millet in Afghanistan. For the latter country, the slight uptrend in wheat yields needs to be accelerated. Viewing the region as a whole there is need for general improvement in wheat and barley yields, particularly in Jordan, Lebanon, Syria and Cyprus.

Sub-Sahara Africa: The important cereals in this region are maize, millet and sorghum. Maize yields averaged 1.1 tons/ha in 1974, whereas millet and sorghum averaged about 0.6 tons/ha. Nigeria, the country with the largest population, shows declining yields for all

three crops, particularly for sorghum. The countries in the low income category show a modest increase in yield trend for maize but a decline in millet yields. Low income countries experiencing little change or declines in yields include Malagasy, Tanzania, Chad, Ethiopia, Guinea, Mali, Niger, Ruwanda, Upper Volta and Zaire. Yields are higher in the Sub-Saharan High Income group, and except for millets, yields are on an uptrend. Most countries in this group, including Ghana, the largest, record downtrends in millet yields.

It would appear that special emphasis should be directed to reversing the yield downtrends for millet and sorghum and to improving yields of maize faster, particularly for Nigeria and other low income countries.

Latin America: Yields of maize, the most important cereal in the region, vary significantly among countries ranging from 0.8 tons/ha in Haiti (a low income country) to 2.8 tons/ha in Argentina. Yields in Mexico average about 1 ton/ha, and although increasing, still fall short of population growth which is among the highest in the world.

The most difficult food problems are in the Middle America/ Caribbean sub-region and in the Andean countries. In the former group, maize yields in most countries have not changed much in the past 15 years. The major exception is El Salvador where maize yields have increased substantially. Rice yields, on the other hand, average 2¾ tons/ha and almost all countries in the sub-region show strong uptrends.

In Bolivia, Colombia and Peru, maize yields run 1¼ to 1½ tons/ha

and rising slowly. However, the maize area has remained more or less unchanged and maize production is lagging behind population growth and demand for cereals. In the case of wheat, which is important in Bolivia and Peru, yields are fairly low, running less than 1 ton/ha, the area harvested is declining and in Peru, yields are on a downtrend. In Colombia, rice (paddy) yields run 4 tons/ha and are on a strong uptrend.

The main need is to improve maize yields, primarily in the Middle America/Caribbean countries and in the Andean Group and for the latter group to improve wheat yields as well.

Recent Trends in Area and Yields (1967-74)

The recent seven-year period, particularly since it was a period with considerable variation in weather, is too short to provide a reliable indication of changes in trend. Nevertheless, the more recent data suggest as follows:

Asia: Wheat and rice appear to be maintaining historical trends in yields (1961-74). However, the expansion in rice area has slowed further, whereas the growth in wheat area has accelerated.

North Africa/Mid East Non-OPEC; The area in wheat has increased more rapidly than earlier, but an offsetting slowdown has occurred in yield. For barley, trends in both area and yield have turned down.

Sub-Sahara Africa: The uptrend in maize yields has come to a halt; yields of millets and sorghum continue to decline. While area in maize and sorghum continues to

rise, that of millets has turned slightly down.

Latin America: The growth in yields of maize has slowed but wheat and rice yields have risen more sharply than earlier. Expansion of area has slowed for all three.

This would appear to put added pressure on the need to improve yields of rice in Asia; wheat and barley in North Africa/Middle East; maize, millet and sorghum in Sub-Sahara Africa; and maize in Latin America.

Root Crops

As noted in Table 1, root crops make up an important part of the diet in cereal deficit countries including Indonesia, Sudan, Sub-Sahara Africa and in some countries in South America. A shortfall in root crop production relative to population growth places added burden on increasing the supply of cereals. Conversely, increasing root crop production may alleviate a situation where the supply of cereals is not forthcoming. Cassava is by far the most important root crop in the developing world, involving a total area harvested of 11.6 hectares in 1974 compared with 2.8 million in sweet potatoes and 2.0 million in yams. During 1961-74, average yields of cassava have increased only 0.6 percent a year, yams 1.0 percent, and potatoes 1.8 percent, while yields of sweet potatoes have declined 2.6 percent a year. Increases in production of cassava and sweet potatoes have come largely from expansion of area.

Although these crops contain only 20-30 percent of the caloric content of cereals and are negligible in protein, crop yields in the low income food deficit countries average about 7 times more

in tonnage per hectare relative to wheat, rice and maize and about 15 times more than sorghum and millet.

Performance 1961-74 (Tables 7 and 8)

Indonesia: Cassava and sweet potatoes are the main crops consumed, with the former accounting for about 80 percent of consumption of root crops. Yields are somewhat below the average for cassava in low income food deficit countries and above average for sweet potatoes. Population is projected to increase about 2.6 percent a year to 1985. The trends in both area and yields are negative for both cassava and sweet potatoes, thus operating to reinforce the prospect for a widening cereal deficit.

Sudan: Cassava represents 85 percent of root crop consumption with sweet potatoes most of the rest. Yields of cassava have shown little change historically while sweet potatoes have increased 1.4 percent a year. Production of root crops, largely from area expansion, increases 3.6 percent a year relative to 3.2 percent for population. Yields of both crops are among the lowest in the developing world.

Sub-Sahara Africa:

Nigeria: Cassava and yams are about equally important in the diet. Yields of both are higher than average, with

yields of cassava increasing 0.7 percent annually and yams 1.5 percent a year. However, the crop area in root crops has changed little so that annual production increases of 1.1 percent a year falls considerably short of projected population increases of 3.0 percent annually.

High Income: All countries in this group are projected to be in deficit for cereals. Cassava is most important generally, with, additionally, yams in Ghana and the Ivory Coast. Yields of both are relatively low. Cassava yields have increased historically about 1.2 percent a year but the major gains have occurred in Ghana and the Ivory Coast where cassava is relatively less important in the food supply. Other countries show little change or declines. For yam, yields declined 1.2 percent, mostly as a result of a substantial drop off in Ghana. Root crop production in Mozambique, Zambia, Liberia and Senegal has lagged appreciably behind population growth.

Low Income: Cassava and sweet potatoes are the major root crops. Yields also run below average. In most countries, yields of cassava have changed very little since the early 1960's. But production has increased substantially due to rapid expansion in area cropped. Yields of sweet potatoes have declined sharply throughout most of the countries but increases in area cropped have more than offset the drop in yields. The major cereal deficit countries

where root crop production lags seriously behind population growth are Benin (Dahomey), Guinea, Kenya, Mali, and Tanzania.

Mid America/Caribbean: Cassava and sweet potatoes are significant in the cereal deficit countries of Haiti and Dominican Republic. Yields are high in the latter country but quite low in Haiti. In the Dominican Republic where yields and area are rising, production of root crops lag slightly behind population growth. In Haiti, yields of cassava increase slowly while those of sweet potatoes tend to decline. Although area is expanding, production of root crops also lags slightly behind the rate of population growth which is quite low.

South America: Brazil is projected to become a cereal exporter. Thus, there is not likely to be a major concern over performance in cassava production, which has increased faster than population growth. In Venezuela, an OPEC country, the fact that root crop production is stable is also not of great moment considering that foreign exchange is not a constraint and a large part of its food supply is imported commercially.

The food problem in Bolivia, Colombia and Peru, all cereal deficit countries with foreign exchange constraints, is another matter. The important root crops in these countries are potatoes and cassava. Potato yields range from 5-6 tons/ha in Peru and Bolivia to over 12 tons/ha in Colombia. Cassava yields are 8-9 tons/ha in Peru and Colombia and

14 ton/ha in Bolivia.

In Bolivia, yields of potatoes have increased almost 3 percent a year, and of cassava almost 2 percent a year. With area of the latter expanding rapidly, root crop production exceeds population growth by a considerable margin. In Colombia, yields of potatoes have risen 1.6 percent a year and of cassava over 4 percent. Coupled with rapid expansion of area, root crop production also exceeds population by a wide margin. Peru, on the other hand, shows a slight negative trend in potato yields and a slight positive trend in cassava yields. With area cropped relatively unchanged, the trend of production of root crops is slightly negative.

It is evident that major emphasis should be given to increasing yields of cassava in Indonesia and much of Africa with subsidary attention in Africa to sweet potatoes and yams in the countries noted earlier. The same applies to Haiti. The problem is less acute in South America except for Peru where performance in potatoes has been disappointing.

Pulses, Groundnuts, and Soybeans

This group of commodities provides about the same amount of calories per unit as cereals but roughly 2-3 times the protein content. Pulses and groundnuts are prevalent in most developing countries. Yields are relatively low, averaging about ½ ton/ha for pulses and 0.8 tons/ha for groundnuts in the shell. Yields per

hectare have not changed much historically, in fact they show a slight downtrend. The trend of production particularly in the low income food deficit countries is also sidewise, thus on a per capita basis the supply of these food commodities is diminishing.

Most of the soybeans in the developing market economies are grown in Brazil, where a substantial export trade has developed. It is also taking hold rapidly in other Latin American countries. Yields average over 1½ tons/ha in this region and are rising about 2½ percent a year.

Performance 1961-74 (See Tables 8 and 9)

Asia: Excluding the Asia High Income Group, where performance has been quite good, yields of pulses have shown little change historically throughout the region. In India, which accounts for 90 percent of the area harvested in the region, pulses make up about 10 percent of the food grain supply. (Pulses have been included in computing the cereal deficit in India shown in Table 2.) Both yield and area have tended to decline historically, with production diminishing almost 1 percent a year. The result is an increasing gap between the supply of pulses and population. This situation is much the same throughout the region.

The trend in yields of groundnuts is only slightly better. With production rising less than 1 percent a year, there is also a widening gap relative to population growth.

Soybean production is relatively unimportant, except in Indonesia and Thailand. Yields in these countries are low and increasing at a much slower rate than in Latin America.

North Africa/Middle East: Yields of pulses have risen in most of the region except in the low income countries of Sudan, Yemen Arab Republic and Afghanistan. For the latter group, expansion of area have increased production about in line with population growth.

For groundnuts, yields show a sharp decline historically throughout the region, again, compensated by enlarging area. Production has risen faster than population.

Soybeans are negligible in the region.

Sub-Sahara Africa: Yields of pulses are substantially below average in Nigeria and show a rapid decline historically. However, large increases in area result in production exceeding population growth. Among the Higher Income Group, yields are about average but little changed historically. Production lags significantly behind population growth in most of the group, particularly in Mozambique, Ivory Coast and Senegal. In the Lower Income Group, yields are also about average and show a tendency to decline historically, with fairly sharp declines in Burundi, Chad, Gambia, Mali, and Niger. In most of this group, expanding area brings increasing production slightly in excess of population growth.

For groundnuts, yields are also significantly below average in Nigeria, with a rapidly declining trend. Together with sharp declines in area, production is also dropping rapidly. In the Higher Income Group, the trend in yields and production is also down, particularly in Angola and Senegal. In the Lower Income Group, yields are relatively low and show a moderate declining trend. Production also lags behind population growth,although less so than in the rest of the region. Significant declines in yield

have occurred in Chad, Mali, Niger, Tanzania, Togo, Upper Volta and Zaire.

There is very little soybean production in this region. Of what there is, yields are very low.

Latin America: Yields of pulses are somewhat higher in this region than average and show a modest uptrend historically. In Mexico, yields have risen close to 3 percent a year. Even so, production lags somewhat behind population growth. Pulses are also important in the diet in Middle America/Caribbean, where yields rise about 1 percent a year, and production increases fall short of population growth. Yields show little change or declines in Guatemala, Haiti, Honduras, and Nicaragua. In South America, yields show little change or declines, with production increasing slower than population in Brazil, Venezuela, Ecuador and Peru. Performance of yield and production in Bolivia and Colombia are more satisfactory. Peru has a sharp downtrend in yields with a slight decline in trend of production.

Groundnuts are of minor significance. Yields are on a declining trend throughout most of the region with increases in area somewhat more than offsetting.

Soybeans: Most of the soybean area is in Brazil, where yields are increasing about 3 percent annually with area expanding very rapidly. Performance in other Latin American countries, while not as high as in Brazil, shows yields rising over 1½ percent a year accompanied by fairly rapid increases in area. The major exception is Peru, where both yields and area have declined.

There is evidently a widespread and urgent need to improve yields of pulses and groundnuts throughout most of the developing world, particularly in the low income food deficit countries in Asia and Africa where the potential cereal deficits are expected to be large. Increasing yields of pulses in the Middle America/ Caribbean countries can also contribute to alleviating the food situation in that area.

Soybeans appear to be performing quite well in Brazil and some other South American countries. At this time, their potential in other regions has hardly been tested.

DEVELOPING MARKET ECONOMIES
IFPRI COUNTRY CATEGORIES

A. DEVELOPING COUNTRIES WITH FOREIGN EXCHANGE

1. Asia Group

Brunei	Singapore	Macao
Hong Kong	South Korea	
Malaysia	Taiwan	

2. North Africa - Middle East OPEC:

Iran	Algeria	Saudi Arabia
Iraq	Libya	Kuwait
Bahrain	Oman	Qatar
United Arab Emirates		

B. DEVELOPING COUNTRIES WITH FOREIGN EXCHANGE CONSTRAINTS
(Countries asterisked are oil exporters which are likely to improve reserve positions.)

1. Other Asia Market Economies:
   a. India
   b. Bangladesh
   c. Pakistan
   *d. Indonesia
   e. Philippines
   f. Thailand
   g. Other Asia: Bhutan, Nepal, Sri Lanka, Burma, Pacific Islands, Papua-New Guinea, Sikkim, Maldive Islands

2. North Africa-Middle East (Non-OPEC):
   a. Egypt
   b. Turkey
   c. Remaining Countries (from Afghanistan to Morocco):
      (1) High Income ($200+):

Jordan	Syria
Lebanon	Tunisia
Morocco	Cyprus

      (2) Low Income (less than $200):

Sudan	Yemen (Aden)
Yemen (Sana)	Afghanistan

3. Sub-Sahara Africa
   *a. Nigeria
   b. Remaining Sub-Sahara:
      (1) High Income ($200+):

Mozambique	Mauritius
Rhodesia	Reunion
Zambia	Senagal
*Angola	Spanish Sahara
Cameroon	French Terr. Afaro & Issas
Congo	Guinea-Bissau
*Gabon	Cape Verde Isles
Ghana	Ceuta & Melilla
Equatorial Guinea	Sao Tome & Principe
Ivory Coast	Seychelles Islands
Liberia	

      (2) Low Income (less than $200):

Kenya	Mali
Malagasy Republic	Mauritania
Malawi	Niger
Tanzania	Rwanda
Uganda	Sierra Leone
Burundi	Somalia
Central Africa Rep.	Togo
Chad	Upper Volta
Dahomey	Zaire
Ethiopia	Lesotho
Gambia	Comoro Islands
Guinea	

4. Latin America:
   a. Argentina
   b. Mexico
   c. Brazil
   *d. Venezuela
   *e. Ecuador
   f. Other Middle America and Caribbean:

Bahamas	Guatemala	Panama
Bermuda	Haiti	*Trinidad & Tobago
Costa Rica	Honduras	Other Caribbean Isles (Martinique, etc.)
Cuba	British Honduras	
Dominican Republic	Jamaica	
El Salvador	Nicaragua	

5. Remaining Latin America:

Bolivia	French Guiana	Peru
Chile	Guyana	Surinam
Colombia	Paraguay	Uruguay

POPULATION IN IFPRI CATEGORIES BY INCOME GROUPS, 1970 EST., 1985 AND 2000 PROJECTED

Income Group	1970 Est. (millions)	1985 Proj. (millions)	2000 Proj. (millions)
Low Income-Food Deficit (under $200 per capita):			
India	549.8	792.4	1,059.4
Bangladesh	68.3	99.4	144.3
Indonesia	121.0	177.7	237.5
Other Asia	52.1	73.7	99.4
NA/ME Non-OPEC Low Income	34.6	53.4	79.0
Nigeria	55.8	85.7	134.9
Sub-Sahara Low Income	130.6	197.0	299.9
Total Low Income	1,012.2	1,479.3	2,054.4
Middle Income-Food Deficit ($200+ per capita):			
Philippines	38.2	61.8	89.7
Egypt	33.7	47.7	64.6
Turkey	35.7	52.4	72.6
NA/ME Non-OPEC High Income	32.3	50.7	75.4
Sub-Sahara High Income	48.3	72.5	110.6
Mexico	51.1	84.2	132.2
Other MA/Carib.	37.0	54.6	78.2
Ecuador	6.1	9.8	14.8
Other Latin America	56.6	84.4	118.9
Total Middle Income	339.0	518.1	759.0
High Income-Food Deficit (high foreign exchange capacity):			
Asia Group High Income	62.2	87.8	115.0
NA/ME OPEC	62.7	100.8	151.0
Venezuela	10.7	16.6	23.6
Total High Income	135.6	205.2	289.6
Total DME-Food Deficit	1,486.8	2,202.6	3,101.0
Grain Exporters:			
Pakistan	61.4	98.9	146.9
Thailand	36.3	58.7	85.6
Argentina	23.9	28.8	32.9
Brazil	96.6	147.1	212.5
Total Exporters	218.2	333.5	477.9
TOTAL DME	1,705.0	2,536.1	3,578.9

Source: United Nations Projections for 1985 and 2000 are U. N. medium-medium variant 1974.

Table 1

Sources of Calories Consumed Per Capita[1/] by IFPRI Country Categories

(Percent of Total Consumed)

Country Country/Grouping	Total per capita Calories/per day	Cereals %	Starchy Foods %	Pulses, Nuts, Seeds %	Sugar %	Vegetables %	Fruit %	Meat %	Eggs %	Milk %	Fish %	Oils and Fats %
Food Deficit Low Income												
India	1964	64.4	1.5	10.3	10.3	1.4	1.4	.3	.1	4.0	.2	5.8
Bangladesh	1995	70.9	.9	2.9	8.3	1.4	1.3	.8	.1	6.9	.6	5.9
Indonesia	1760	60.4	19.2	6.9	4.1	.7	1.0	1.1	.2	.1	1.1	4.8
Other Asia	2066	72.7	1.8	6.3	4.8	1.3	1.3	1.3	.3	2.2	1.2	6.3
NA/ME Non-OPEC Low	2071	65.2	9.9	8.9	4.2	1.0	2.0	4.0	.1	4.9	.2	4.6
Nigeria	2166	51.5	30.2	7.1	.8	.4	.6	1.4	.1	.7	.3	6.8
Sub Sahara Low	2133	53.8	22.6	10.0	2.6	.6	.8	3.5	.2	1.7	.5	3.6
Food Deficit Middle Income												
Philippines	1911	62.7	5.6	2.8	9.5	.8	3.8	5.1	.5	1.1	2.7	4.7
Egypt	2639	69.6	1.0	3.1	8.1	2.7	3.3	2.3	.2	2.8	.3	6.6
Turkey	2769	61.9	2.8	5.0	5.8	2.0	3.8	2.7	.3	3.9	.2	9.4
NA/ME Non-OPEC High	2248	60.0	.9	3.6	10.6	1.5	4.1	3.4	.4	3.4	.4	11.6
Sub Sahara High	2208	47.1	30.5	6.3	4.0	.6	1.0	2.6	.1	1.3	1.1	5.3
Mexico	2624	32.0	1.5	8.6	16.0	.3	3.7	5.3	.6	3.7	.2	7.7
Other NA/Carit.	2156	46.9	8.7	6.1	15.8	.8	3.0	4.6	1.2	4.6	.7	7.2
Ecuador	1848	31.3	15.3	7.0	16.0	1.6	6.1	7.7	.4	6.4	.5	7.2
Other Latin America	2302	40.5	12.5	2.7	16.2	1.1	2.6	8.6	.5	6.0	.8	7.6
Food Deficit High Income												
Asia Group High	2329	69.5	7.2	3.3	5.0	1.8	1.6	4.5	.4	.8	1.6	3.8
NA/ME OPEC	2007	63.6	1.7	2.6	11.8	1.2	4.1	3.3	.2	3.3	.1	7.8
Venezuela	2367	37.6	13.4	3.7	15.4	.4	2.0	9.1	.8	6.4	1.6	9.1
Food Exporters												
Pakistan	1995	70.9	.9	2.9	8.3	1.4	1.3	.8	.1	6.9	.6	5.9
Thailand	2226	72.1	3.0	5.8	5.3	.9	3.3	3.7	.7	.8	2.2	1.9
Argentina	2885	34.6	6.2	.8	13.1	1.0	3.0	21.3	.8	7.1	.4	11.3
Brazil	2541	33.9	16.1	12.2	15.8	.4	1.9	8.0	.7	5.3	.5	5.1

1/ Computed from Food Balance Sheets 1964-66 FAO, Rome 1971

Table 2

Cereal Deficits 1969-71 and 1985/86 Projected by IFPRI Country Categories[1/]

Country/Country Grouping	1969-71 Average (Mil. Met. Tons)	1985/86 Projected (Mil. Met. Tons)
Asia High Income	-5.8	-16.8 to -20.4
	-2.5	-20.0 to -25.5
	(-5.7)	(-29.4 to -34.4)
Other Asia Market Economies	(+3.2)	(+9.0 to +9.4)
India	-2.2	-14.2 to -16.8
Bangladesh	-0.7	-5.3 to -5.5
Pakistan	-0.8	+3.7 to +3.9
Indonesia	-1.3	-6.7 to -8.6[2/]
Philippines	-0.7	-1.5 to -1.8
Thailand	+3.2	+5.3 to +5.6
Other Asia	0.0	-1.7
	-8.3	-36.8 to -45.9
	(-11.5)	(-46.2 to -54.8)
Total Asia	(+3.2)	(+9.0 to +9.4)
N. Af./MidEast OPEC	-2.6	-10.7 to -11.4
NA/ME Non-OPEC	-5.3	-10.6 to -11.2
Egypt	-2.0	-3.6
Turkey	-0.4	-2.0 to -2.2
NA/ME Hi Inc.	-2.4	-2.7 to -2.9
NA/ME Lo Inc.	-0.4	-2.3 to -2.4
Total NA/ME	-7.9	-21.4 to -22.5
Nigeria	-0.4	-7.6 to -8.1[3/]
Sub-Sahara Hi Inc.	-0.8	-2.0
Sub-Sahara Lo Inc.	-0.3	-4.1 to -4.8
Total Sub-Sahara	-1.5	-13.7 to -14.9
Mexico	-0.1	-.8 to -2.2
Other Mid-Am./Carib.	-2.4	-4.2 to -4.4
Argentina	+8.2	+15.7 to +16.1
Brazil	-1.7	+1.1 to +3.4
Venezuela	-0.9	-2.1 to -3.1
Ecuador	-0.1	-.7 to -.8
Other Lat. Am.	-2.0	-5.4 to -5.6
	+1.0	+.7 to +6.4
	(-7.3)	(-13.2 to -16.1)
Total Lat. Am.	(+8.3)	(+16.8 to +19.5)
	-16.7	-65.5 to -82.6
	(-28.2)	(-94.5 to -108.3)
Total DME	(+11.5)	(+25.7 to +29.0)

Source: IFPRI Research Report #1

Note: Parenthesis sum deficits and surpluses separately. Net deficit or surplus shown without parenthesis.

1/ For listing of countries see Annex A.

2/ If recent production growth rates prevail, the deficit would be reduced to 1-3 million tons.

3/ Projected deficit from other sources ranges from 3-6 million tons.

Table 4

Food Priority and Other Developing Countries
(Categorized by U.N. World Food Council Secretariat,
U.N. WFC/20 14 April 1976)

Developing Market Economies	Population 1975 (millions)	Population Growth Rate 1975-85 %	Cereal Deficit (IFPRI) 1969/71 million tons	Cereal Deficit (IFPRI) 1985/86 proj. High Income Growth million tons	Cereal Growth Rates (FAO data) (1961-74) Area %	Cereal Growth Rates (FAO data) (1961-74) Yield %	Cereal Growth Rates (FAO data) (1961-74) Production %
Food Priority Countries							
Afghanistan	19.3	2.7	.1	1.1	0.2	1.0	1.2
Bangladesh	73.7	2.9	.7	5.5	1.0	0.4	1.5
Benin (Dahomey)	3.1	2.8	(1/)	.1	-1.2	2.2	1.0
Burma	31.2	2.4	.7	.5	0.4	0.4	0.8
Cameroon	6.4	2.3	1/	.3	1.8	0.1	1.9
Chad	4.0	2.2	0	1/	-2.3	-3.8	-6.1
Egypt	37.5	2.3	2.0	3.6	0.5	2.1	2.6
El Salvador	4.1	3.2	1/	1/	1.4	4.0	5.5
Ethiopia	28.0	2.5	1/	1.0	1.4	0.6	2.0
Guinea	4.4	2.6	1/	1/	3.0	-0.5	2.5
Haiti	4.6	1.8	1/	.2	0.9	1.8	2.8
Honduras	3.0	3.4	1/	.2	0.5	-0.1	0.4
India	613.2	2.5	2.2	16.8	0.8	1.8	2.6
Indonesia	136.0	2.6	1.3	8.6 2/	1.1	3.1	4.3 2/
Kenya	13.3	3.4	(1/)	.4	1.3	1.6	2.9
Madagascar	8.0	3.1	1/	.3	2.2	-0.6	1.6
Malawi	4.9	2.6	1/	(1/)	2.8	1.5	4.4
Mali	5.7	2.6	1/	.5	0.6	-2.5	-1.9
Mozambique	9.2	2.4	1/	.2	0.4	1.7	2.1
Nepal	12.6	2.6	(.2)	.4	1.4	-0.8	0.6
Niger	4.6	2.8	0	.3	0.2	-1.1	-0.8
Pakistan	70.6	3.3	.8	(3.7)	1.6	4.1	5.8
Philippines	44.4	3.2	.7	1.8	1.5	2.2	3.8
Rwanda	4.2	3.0	(.1)	1/	3.3	-1.9	1.4
Senegal	4.4	2.5	.2	.6	0.4	-0.7	-0.3
Sierra Leone	3.0	3.0	1/	.2	2.1	1.8	4.0
Somalia	3.2	2.9	N/A	N/A	N/A	N/A	N/A
Sri Lanka	14.0	1.9	.9	1.0	1.5	3.0	4.6
Sudan	18.3	3.2	.2	.7	5.0	-1.6	3.3
Tanzania	15.4	3.2	1/	1.1	3.0	0.2	3.2
Uganda	11.4	3.1	0	(1/)	1.6	1.8	3.4
Upper Volta	6.0	2.4	1/	.3	-0.1	-0.7	-0.8
Yemen A.R.	6.7	3.0	N/A	N/A	-1.2	1.9	0.7
Other Developing Countries							
Algeria	16.8	3.4	.6	3.1	.4	.8	1.2
Angola	6.4	2.6	(1/)	.1	0.2	-0.0	0.2
Argentina	25.4	1.2	(8.2)	(15.7)	1.5	2.1	3.6
Bolivia	5.4	2.6	.2	.4	0.5	1.3	1.9
Brazil	109.7	2.8	1.7	(1.1)	3.9	0.1	4.0
Burundi	3.5	2.7	0	(.2)	7.1	2.1	9.4
Chile	10.3	1.8	.8	2.0	-0.9	1.6	0.7
Colombia	25.9	3.1	.4	.9	0.4	3.6	4.0
Cuba	9.4	2.1	1.3	2.0	1.4	3.2	4.7
Dominican Republic	5.1	3.4	.1	.4	0.6	3.9	4.6
Ecuador	7.1	3.2	.1	.8	-0.5	2.9	2.3
Ghana	9.9	3.1	.2	1/	5.0	1.2	6.3
Guatemala	6.1	3.0	.1	.2	2.2	0.1	2.3
Hong Kong	4.2	1.4	.6	.8	-9.7	2.1	-7.0
Iran	32.9	3.2	.6	4.2	3.6	.2	3.8
Iraq	11.1	3.5	.5	1.9	-1.0	2.9	1.8
Ivory Coast	4.9	2.7	.2	.3	2.2	2.4	4.7
Korea (Republic)	33.9	2.0	2.6	6.0	-0.7	2.7	2.0
Malaysia	12.0	2.9	.7	.4	4.3	1.6	6.0
Mexico	59.2	3.4	.1	2.2	1.6	2.4	4.2
Morocco	17.5	3.1	.7	(.5)	2.0	3.1	5.2
Nigeria	62.9	3.0	.4	8.1	1.1	-1.6	-0.5
Peru	15.3	2.9	.7	1.9	0.7	0.7	1.4
Saudi Arabia	9.0	3.1	.5	1.0	3.3	-0.2	3.0
Syria	7.3	3.4	.5	1.1	-0.2	-1.6	-1.8
Thailand	42.1	3.2	(3.2)	(5.3)	2.2	.6	2.9
Tunisia	5.7	2.8	.4	.4	-0.4	6.1	5.7
Turkey	39.9	2.6	.4	2.2	0.4	1.6	2.0
Uruguay	3.1	1.0	1/	(.1)	-1.0	3.2	2.1
Venezuela	12.2	2.9	.9	3.1	1.8	1.4	3.2
Zaire	24.5	2.8	.2	.3	10.0	-2.0	7.8
Zambia	5.1	3.3	1/	1/	-0.1	0.7	0.6

Note: Figures in parentheses are exports
* Countries with over 3 million population

1/ Less than 100,000 tons

2/ The data base makes the deficit for Indonesia subject to unusual uncertainty. Projections of deficit by other institutions range from 1 to 3 million tons.

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Table 5

Average Yields of Principal Cereals in IFPRI Country Categories[1/] - 1974
(metric tons per hectare)
(area harvested in million hectares in parentheses)

Country/Country Grouping	Wheat	Rice (paddy)	Barley	Maize	Sorghum	Millet
Asia High Income	1.36 (.1)	4.25 (2.6)	2.35 (.8)			
India	1.16 (19.1)	1.64 (37.5)	.89 (2.6)	.91 (5.8)	.47 (17.0)	.49 (18.5)
Bangladesh		1.74 (9.9)				
Pakistan	1.25 (6.1)	2.09 (1.6)		1.08 (.6)	.63 (.5)	.51 (.6)
Indonesia		2.68 (8.5)		.97 (2.8)		
Philippines		1.61 (3.5)		.83 (2.8)		
Thailand		1.70 (7.7)		2.14 (1.1)		
Other Asia		1.82 (6.9)		1.51 (.6)		
Other Asia Market Economies	1.18 (25.6)	1.80 (75.6)	.87 (2.9)	1.04 (13.8)	.49 (17.6)	.49 (19.3)
N. Af./MidEast OPEC	.74 (8.9)		.71 (2.7)			
Egypt	3.45 (.6)	4.90 (.5)		3.83 (.7)		
Turkey	1.29 (8.6)		1.28 (2.6)	1.72 (.6)		
MA/ME Hi Inc.	.97 (4.8)		1.09 (3.2)			
MA/ME Lo Inc.	1.17 (2.8)				.84 (3.0)	.44 (1.1)
MA/ME Non-OPEC	1.25 (16.8)	4.01 (.8)	1.19 (6.4)	2.14 (2.3)	.84 (3.1)	1.02 (1.4)
Nigeria					.62 (5.6)	.57 (4.9)
Sub-Sahara Hi Inc.		1.30 (.7)		1.66 (2.8)	.81 (.8)	.59 (2.3)
Sub-Sahara Lo Inc.		1.31 (2.9)		.96 (7.2)	.67 (3.9)	.56 (6.3)
Total Sub-Sahara		1.31 (3.9)		1.12 (11.3)	.65 (10.4)	.57 (13.5)
Mexico	3.55 (.78)			.99 (7.8)	2.31 (1.2)	
Other Mid-Am./Carib.		2.23 (.6)		.92 (2.1)	1.08 (.3)	.78 (.3)
Argentina	1.44 (3.9)			2.84 (3.5)	2.44 (2.5)	
Brazil	1.10 (2.5)	1.56 (4.4)		1.34 (12.0)		
Venezuela		2.86 (.1)		1.09 (.5)		
Ecuador		2.55 (.1)		.94 (.3)		
Other Lat. Am.	1.24 (1.4)	3.43 (.7)	1.18 (.5)	1.38 (1.7)		
Total Lat. Am.	1.49 (8.7)	1.94 (6.1)		1.39 (27.9)	2.32 (4.4)	
Low Income Deficit	1.1 (23.7)	1.8 (66.2)	.9 (5.0)	1.0 (18.3)	.6 (29.6)	.5 (31.1)
Middle Income Deficit	1.4 (16.4)	2.2 (6.3)	1.2 (6.6)	1.2 (19.2)	1.6 (2.6)	.9 (2.9)
High Income Deficit	.7 (9.0)	4.0 (3.2)	1.1 (3.5)	1.2 (.6)	1.4 (.2)	1.1 (.2)
Total Food Deficit	1.1 (49.1)	1.9 (75.8)	.9 (15.1)	1.1 (38.2)	.7 (32.3)	.5 (34.2)
Food Exporters	1.3 (12.5)	1.7 (13.8)	.8 (.6)	1.7 (17.2)	2.2 (2.[illegible])	.7 (.2)
Total DME	1.17 (61.6)	1.89 (89.5)	1.1 (15.7)	1.28 (55.4)	.8 (35.6)	.55 (34.9)

Source: FAO Production Yearbook 1974

1/ For listing of countries see Annex A.

Table 6

Cereals: Growth Rates of Area, Yield and Production 1961-74 by IFPRI Categories
(Percent per year compounded)

Country/Region	Total Cereals			Wheat			Rice (Paddy)			Barley			Maize			Sorghum			Millets		
	A	Y	P	A	Y	P	A	Y	P	A	Y	P	A	Y	P	A	Y	P	A	Y	P
Asia High Income	0.02	2.14	2.15	-3.67	0.05	-3.63	0.86	1.30	2.16	-0.44	3.70	2.77									
Other Asia Market Economies	0.98	1.81	2.81	3.29	4.26	7.67	0.87	1.47	2.35		1/		2.14	0.73	2.89	-0.79	0.08	-0.71	0.26	1.56	1.82
India	0.80	1.81	2.63	3.61	4.41	8.18	0.59	1.30	1.89	-1.72	1.30	-0.44	2.49	-0.02	2.47	-0.85	-0.16	-1.00	0.35	1.67	2.02
Bangladesh	1.04	0.45	1.49				0.98	0.47	1.45												
Pakistan	1.57	4.14	5.78	2.17	4.01	6.26	1.85	5.20	7.14				2.81	0.80	3.64	0.11	2.35	2.47	-2.52	0.42	-2.11
Indonesia	1.15	3.12	4.30				1.74	3.38	5.18				-0.40	-0.03	-0.43						
Philippines	1.50	2.23	3.76				0.62	2.58	3.22				2.77	2.44	5.28						
Thailand	2.21	0.63	2.86				1.46	0.48	1.95				10.20	0.55	10.80						
Other Asia	0.71	0.39	1.11				0.54	0.64	1.18				0.14	-0.52	-0.38						
N. Af./MidEast OPEC	1.66	1.16	2.83	2.67	0.87	3.56				-1.23	1.00	-0.24									
NA/ME Non-OPEC	0.76	1.48	2.24	0.98	1.80	2.80		1/		-0.11	1.36	1.24	-0.30	2.29	1.98	0.91	0.48	1.39	4.85	-3.18	1.51
Egypt	0.47	2.11	2.59	-0.32	2.13	1.80	3.92	-0.16	3.75				-0.45	3.30	2.83						
Turkey	0.37	1.62	2.00	1.03	1.97	3.02				-1.00	1.00	-0.02	-0.74	2.13	1.37						
NA/ME Non-OPEC Hi Inc.	0.70	2.38	3.10	0.98	2.14	3.14				0.79	2.86	3.62									
NA/ME Non-OPEC Lo Inc.	1.55	0.19	1.74	1.09	1.00	2.10										1.19	0.32	1.52	7.61	-4.86	2.38
Nigeria	1.08	-1.57	-0.51													0.91	-2.84	-1.96	1.29	-0.49	0.79
Sub-Sahara Hi Inc.	1.02	1.28	2.30				0.19	2.68	2.87				1.74	1.40	3.16	0.47	0.79	1.26	0.67	-0.60	0.07
Sub-Sahara Lo Inc.	1.39	0.44	1.84				3.63	-0.68	2.92				2.53	0.89	3.44	0.98	-0.09	0.89	-0.37	-0.62	-0.98
Total Sub-Sahara	1.24	0.11	1.35				2.96	0.14	3.10				2.09	0.94	3.05	0.89	-1.48	-0.61	0.38	-0.57	-0.19
Mexico	1.65	2.45	4.15	-1.32	5.03	3.64							0.84	1.18	2.03	20.63	0.62	21.38			
Other Mid-Am./Carib.	1.18	1.71	2.90				1.98	4.03	6.09				1.00	0.59	1.60	1.70	1.31	3.07	0.72	0.91	1.63
Argentina	1.47	2.10	3.60	-1.26	0.04	-1.22							2.58	3.16	5.82	9.99	2.27	12.49			
Brazil	3.94	0.07	4.02	10.60	2.57	13.44	2.59	-0.83	1.74				3.54	0.68	4.24						
Venezuela	1.80	1.37	3.19				3.22	3.81	7.15				1.32	0.19	1.51						
Ecuador	-0.53	2.86	2.22				-2.76	5.04	2.13				2.02	2.98	5.06						
Other Lat. Am.	0.28	2.09	2.38	-1.85	1.11	-0.76	1.31	3.29	4.64	1.35	-0.11	1.24	0.32	1.35	1.68						
Total Lat. Am.	2.18	1.43	3.64	0.52	0.52	1.04	2.31	0.53	2.86		1/		2.10	1.53	3.66	11.67	2.77	14.77		1/	
Total DME	1.19	1.50	2.70	2.04	2.14	4.18	1.05	1.34	2.40	-0.55	1.43	0.84	2.09	1.23	3.23	0.70	1.67	2.38	0.43	0.49	0.97
Low Inc. Food Deficit	0.96	1.37	2.35	3.24	3.73	7.10	0.90	1.37	2.28	-0.64	0.89	0.24	1.70	0.26	1.96	-0.10	-0.46	-0.56	0.52	0.60	1.12
Mid Inc. Food Deficit	0.87	1.96	2.85	0.58	2.06	2.65	0.93	2.67	3.62	-0.03	1.43	1.40	1.07	1.37	2.46	5.97	5.74	12.05	0.48	0.13	0.62
High Inc. Food Deficit	1.28	1.36	2.47	2.53	0.65	3.22	1.21	1.35	2.51	-1.07	2.12	1.16	1.70	1.20	2.94	1.98	0.16	2.14	-2.29	3.95	1.46
Total Food Deficit DME	0.96	1.31	2.45	2.13	2.16	4.59	0.91	1.42	2.38	-0.49	1.06	0.97	1.37	0.96	2.22	0.26	0.65	0.92	0.50	1.04	1.05
Food Exporters	2.48	1.36	3.88	1.74	1.22	2.98	1.89	0.61	2.51	-1.66	0.31	-1.35	3.59	1.51	5.16	7.64	4.11	12.06	-1.95	0.32	-1.64

Data Source: FAO Production Yearbooks.

1/ Relatively unimportant in regional total.

Table 7

Average Yields of Major Root Crops in IFPRI Country Categories,[1] 1974
(metric tons per hectare)
(area harvested in thousand hectares in parentheses)

Country/Country Grouping	Cassava	Yams	Sweet Potatoes	Potatoes
Asia High Income			16.7 (105)	10.4 (45)
India	17.3 (367)		7.8 (230)	8.7 (533)
Bangladesh			10.5 (61)	9.1 (80)
Pakistan			9.2 (17)	10.2 (23)
Indonesia	7.0 (1350)		6.2 (350)	
Philippines	5.4 (40)		4.8 (132)	
Thailand	19.7 (320)[2]			
Other Asia	5.4 (129)		4.3 (120)	5.8 (64)
Other Asia Market Economies	8.8 (2356)		6.6 (946)	8.27 (743)
N. Af./MidEast OPEC				7.7 (117)
Egypt				17.0 (44)
Turkey				12.2 (180)
NA/ME Hi Inc.				11.4 (48)
NA/ME Lo Inc.	4.8 (230)		3.5 (141)	—
NA/ME Non-OPEC	4.8 (230)		3.9 (144)	12.7 (284)
Nigeria	10.0 (1000)	11.1 (1350)		
Sub-Sahara Hi Inc.	6.1 (1582)	6.3 (351)	4.9 (190)	
Sub-Sahara Lo Inc.	7.2 (3724)	7.0 (186)	4.1 (1051)[2]	5.4 (191)
Total Sub-Sahara	7.4 (6306)	9.8 (1886)	4.2 (1292)[2]	
Mexico				11.2 (40)
Other Mid-Am./Carib.	6.3 (79)		6.7 (32)	
Argentina			6.3 (51)	16.2 (111)
Brazil	13.7 (2196)		11.9 (162)	9.8 (171)
Venezuela	8.6 (38)			10.1 (12)
Ecuador	9.2 (59)			9.2 (48)
Other Lat. Am.	10.1 (295)			7.2 (375)
Total Lat. Am.	12.8 (2692)		9.9 (319)	9.0 (974)
Low Income Food Deficit	8.0 (6801)	10.4 (1589)	5.2 (1964)[2]	7.7 (919)
Middle Income Food Deficit	6.8 (2104)	6.6 (373)	5.9 (429)	8.2 (802)
High Income Food Deficit			16.6 (108)	8.6 (174)
Total Food Deficit	7.7 (8962)	9.7 (1970)	5.7 (2532)[2]	8.0 (1896)
Food Exporters	12.9 (2642)		10.3 (266)	12.1 (307)
Total DME	8.9 (11604)	9.7 (1970)	6.2 (2783) (1973)	8.6 (2202)

Source: FAO Production Yearbook 1974[1] For listing of countries see Annex A.[2]
1973 data where 1974 crop failed.

Table 8

Selected Food Crops: Growth Rates, Area, Yield and Production 1961-74 by IFPRI Categories
(Percent per year compounded)

Country/Region	Root Crops			Cassava			Yams			Sweet Potatoes			Potatoes			Pulses			Soybeans			Groundnuts		
	A	Y	P	A	Y	P	A	Y	P	A	Y	P	A	Y	P	A	Y	P	A	Y	P	A	Y	P
Asia High Income	0.39	0.93	1.32							0.74	0.85	1.60	-0.67	1.39	0.70	1.15	2.11	3.28	0.97	3.31	4.31	7.60	2.47	10.26
Other Asia Market Economies	0.95	1.73	2.70	0.85	1.80	2.66				0.03	0.78	0.81	2.79	2.58	5.44	-0.70	-0.00	-0.70	2.45	1.24	3.73	-0.07	0.88	0.81
India	3.30	4.18	7.61	3.52	7.24	11.01				4.69	1.65	6.42	2.63	2.29	4.97	-0.86	-0.13	-0.99				-0.31	0.63	0.31
Bangladesh	4.47	3.38	8.00							5.26	2.02	7.38	3.88	4.57	8.62	0.05	0.92	0.97				9.75	0.41	10.20
Pakistan	2.80	1.47	4.32							1.21	0.41	1.63	4.25	2.21	6.55	-1.41	0.03	-1.38				9.86	1.22	11.21
Indonesia	-1.47	-0.46	-1.93	-1.14	-0.47	-1.60				-3.06	-0.44	-3.49				4.04	-0.04	4.00	1.78	1.03	2.83	0.73	1.00	1.73
Philippines	-0.56	-0.79	-1.34	-0.13	-1.49	-1.62				-0.76	-0.38	-1.13				-2.11	-0.59	-2.68	-1.40	-0.62	-2.01	4.60	-1.72	2.80
Thailand	9.18	-0.08	9.09	10.22	-0.74	9.41										12.83	-1.65	10.96	11.82	0.44	12.32	4.90	1.33	6.30
Other Asia	3.31	0.90	4.24	7.44	-2.84	4.39				2.33	2.26	4.65	0.32	3.83	4.16	0.65	1.05	1.71	3.18	-0.09	3.16	0.41	2.36	2.78
N.Af./MidEast OPEC	4.71	-0.85	3.82										4.71	-0.85	3.82	1.70	1.51	3.23	15.18	20.22	45.07	0.19	2.30	2.50
NA/ME Non-OPEC	3.44	0.60	4.06		1/					3.89	0.45	4.36	3.81	1.19	5.05	1.53	1.07	2.62	1.54	5.47	7.10	7.67	-1.70	5.86
Egypt	4.21	0.44	4.67										4.98	0.54	5.55	-2.86	3.12	0.18				-1.26	-0.94	-2.19
Turkey	2.22	1.14	3.40										2.22	1.14	3.40	0.77	0.22	0.99	1.54	5.47	7.10	6.33	-0.11	6.21
NA/ME Hi Inc.	3.78	0.78	4.58										3.78	0.77	4.58	2.44	1.93	4.42				12.77	-1.57	11.00
NA/ME Lo Inc.	3.32	0.33	3.67	2.91	-0.04	2.86				4.09	1.43	5.58	0.85	3.28	4.16	3.18	-0.02	3.15				7.94	-1.60	6.20
Nigeria	-0.06	1.17	1.10	1.50	0.72	2.23	-1.05	1.49	0.42							8.12	-2.75	5.14				-2.94	-5.59	-8.37
Sub-Sahara Hi Inc.	2.12	0.51	2.64	1.82	1.18	3.02	1.70	-1.17	0.51	5.26	-0.12	5.12				1.89	-0.37	1.52	-3.13	1.12	-2.05	1.23	-0.93	0.29
Sub-Sahara Lo Inc.	6.15	-1.70	4.35	5.14	-0.19	4.94	-0.23	2.79	2.56	8.02	-5.36	2.24	3.58	1.35	4.97	2.58	0.42	3.01	2.71	3.06	5.86	2.48	-0.45	2.01
Total Sub-Sahara	3.60	-0.84	2.74	3.53	0.31	3.84	-0.51	1.03	0.51	7.87	-4.85	2.64		1/		4.34	-0.96	3.33	0.06	1.15	1.21	0.63	-2.09	-1.47
Mexico	-0.95	3.88	2.89										-1.19	3.85	2.62	-0.21	2.96	2.74	25.93	-1.69	23.80	-3.84	0.62	-3.25
Other Mid-Am./Carib.	2.27	1.33	3.63	1.93	1.39	3.35				1.65	0.15	1.80				0.44	1.04	1.49				2.78	0.79	3.60
Argentina	-1.09	1.71	0.60							1.74	-0.99	0.73	-2.32	3.12	0.73	4.68	-1.79	2.81	32.98	3.01	36.98	1.62	-2.63	-1.06
Brazil	2.88	0.62	3.52	3.30	0.24	3.54				1.40	1.71	3.14	0.24	3.37	3.62	2.49	-0.45		24.82	3.03	28.60	1.67	-0.34	1.32
Venezuela	2.10	-1.98	0.09	3.56	-4.00	-0.57							-0.32	1.65	1.33	0.66	-2.26	-1.62				25.66	-2.11	23.01
Ecuador	3.95	2.04	6.07	6.65	0.66	7.36							2.76	2.80	5.63	0.38	-0.51	-0.13	67.46	-2.51	63.91	1.57	-1.85	-0.31
Other Lat. Am.	0.86	1.32	2.19	1.73	1.45	3.20							0.41	1.15	1.57	1.99	-0.15	1.84	18.94	1.65	20.90	1.26	0.10	1.37
Total Lat. Am.	2.05	1.02	3.09	3.09	0.36	3.47				1.19	1.23	2.43	0.03	1.97	1.99	1.47	0.64	2.13	24.74	2.47	27.82	1.67	-0.93	0.74
Total DME	2.67	0.16	2.84	2.80	0.62	3.44	-0.40	0.97	0.58	4.47	-2.60	1.76	1.54	1.85	3.41	0.67	-0.04	0.63	12.32	5.44	18.43	0.56	-0.27	0.29
Low Inc. Food Deficit	2.90	-0.33	2.56	2.75	0.41	3.17	-0.84	1.38	0.54	5.23	3.42	1.63	2.86	2.37	5.30	0.52	-0.41	0.10	1.41	-1.20	2.63	0.28	-0.24	0.04
Mid Inc. Food Deficit	1.63	0.88	2.52	1.81	1.17	3.00	1.68	-0.91	0.76	1.82	-0.15	1.67	1.05	1.55	2.61	0.66	1.49	2.16	20.85	0.61	21.59	1.28	-0.77	0.50
Hi Inc. Food Deficit	1.86	-0.31	1.54		1/			1/		0.78	0.83	1.62	2.50	-0.08	2.42	1.46	1.11	2.59	1.28	3.59	4.92	9.64	-0.68	8.89
Total Food Deficit DME	2.59	-0.08	2.50	2.51	0.58	3.10	-0.40	0.97	0.58	4.67	-2.99	1.54	2.01	1.68	3.73	0.54	-0.07	0.47	3.48	3.82	7.43	0.44	-0.30	0.14
Food Exporters	3.06	0.75	3.84	3.92	0.19	4.12		1/		1.64	1.25	2.91	-0.61	2.87	2.25	1.58	-0.02	1.56	24.29	2.97	27.38	2.39	-0.65	1.73

Data Source: FAO Production Yearbook Tapes

1/ Relatively unimportant in regional total.

Table 9

Average Yields of Pulses, Soybeans, and Groundnuts in IFPRI Country Categories[1], 1974
(metric tons per hectare)
(area harvested in thousand hectares in parentheses)

Country/Region	Pulses	Soybeans	Groundnuts in shell
Asia High Income	0.61 (52)	0.68 (383)	1.48 (12)
Other Asia Market Economies	0.44 (25367)	0.83 (811)	0.81 (7834)
India	0.42 (22016)	—	0.76 (656)
Bangladesh	0.75 (307)	—	1.38 (24)
Pakistan	0.51 (1588)	—	1.32 (38)
Indonesia	0.50 (572)	0.79 (700)	1.26 (420)
Philippines	0.47 (61)	0.76 (2)	0.37 (35)
Thailand	1.09 (250)	1.13 (102)	1.58 (145)
Other Asia	0.58 (574)	1.07 (8)	0.79 (611)
N. Af./MidEast OPEC	0.70 (435)	1.55 (20)	2.09 (7)
NA/ME Non-OPEC	0.96 (1251)	1.23 (5)	1.25 (878)
Egypt	2.10 (163)	—	1.88 (16)
Turkey	1.12 (624)	1.23 (5)	2.19 (16)
NA/ME Hi Inc.	0.73 (929)	—	1.25 (34)
NA/ME Lo Inc.	1.17 (159)	—	1.22 (811)
Nigeria	0.19 (4610)	0.38 (170)	0.50 (1200)
Sub-Sahara Hi Inc.	0.51 (664)	0.60 (.4)	0.86 (1955)
Sub-Sahara Lo Inc.	0.51 (5089)	0.49 (16)	0.61 (2685)
Total Sub-Sahara	0.37 (10363)	0.39 (186)	0.67 (5840)
Mexico	0.69 (1921)	1.67 (245)	1.27 (51)
Other Mid-Am./Carib.	0.74 (448)	—	0.90 (106)
Argentina	1.08 (135)	1.48 (334)	0.84 (344)
Brazil	0.61 (3688)	1.56 (4793)	1.37 (350)
Venezuela	0.39 (106)	—	0.85 (20)
Ecuador	0.58 (113)	1.19 (.8)	0.92 (12)
Other Lat. Am.	0.77 (390)	1.98 (169)	0.88 (35)
Total Lat. Am.	0.66 (7001)	1.58 (5543)	1.08 (919)
Low Income Food Deficit	0.41 (33327)	0.71 (893)	0.75 (12312)
Middle Income Food Deficit	0.73 (4888)	1.78 (422)	0.88 (2261)
High Income Food Deficit	0.63 (594)	0.72 (403)	1.26 (38)
Total Food Deficit	0.46 (38809)	0.97 (1719)	0.77 (14611)
Food Exporters	0.62 (5661)	1.55 (5229)	1.19 (878)
Total DME	0.48 (44470)	1.41 (6948)	0.80 (15489)

Source: FAO Production Yearbook 1974.

1/ For listing of countries see Annex A.

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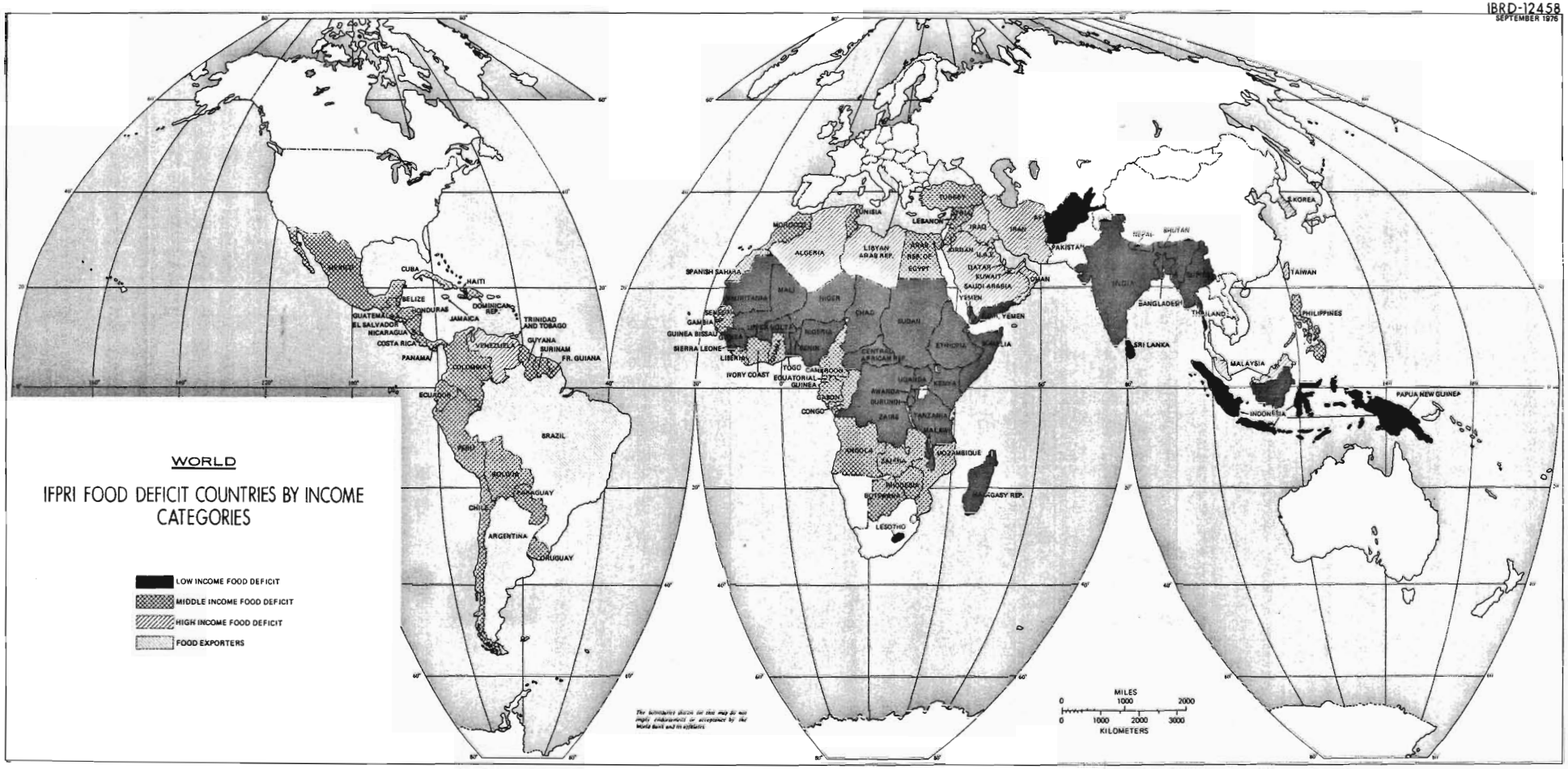

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