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USAID and Agricultural Research

Review of USAID Support
for Agricultural Research—
1952–1996

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The views and interpretations expressed in this paper are those of the author and are not necessarily those of the US Agency for International Development or of The World Bank.

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Foreword

USAID has welcomed the establishment of the Agricultural Research and Extension Group (ESDAR) located in the World Bank. The global situation with regard to agricultural research institutions in developing countries has changed significantly. Now, increased local capacities for research contrast with substantially reduced donor funding for research and technology programs. International commitment to and support for public goods research institutions can be seen to be wavering. Fortunately, however, the World Food Summit of 1996 effectively highlighted the continuing need for technological development to meet world food needs.

ESDAR provides an important opportunity for a global partnership to build the technology and institutional systems needed for developing countries to be able to address problems of poverty, food insecurity, and sustainable management of natural resources.

Though USAID resources for agricultural technology programs have declined over the past decade, the Agency maintains its strategic commitment to development of the technology institutions needed to address global concerns

of food security, environmental protection, and poverty alleviation. This commitment is reflected in the Agency's establishment of a "Center for Economic Growth and Agricultural Development."

USAID recognizes the need for a new paradigm in support for international agricultural technology programs and seeks to work with ESDAR partners in developing a global agricultural technology system to serve the needs of developing countries.

This review of past and current USAID support for agricultural research provides the best available summary of the substantial past support that USAID has provided to this effort. It provides a valuable contribution to understanding the changed conditions and nature of USAID assistance to international agricultural technology programs and will be useful as background in planning future research support.

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Preface

In September, 1995, after eighteen years overseas in USAID Missions, I began an assignment in ESDAR (the Agricultural Research and Extension Group at the World Bank). The major purpose of this assignment was to coordinate USAID and World Bank activities in agricultural research. It was apparent that my first objective had to be to review the range of USAID agricultural research activities in order to identify areas of potential collaboration with the World Bank and other donors. This paper documents some of my findings and conclusions from this review.

My first step was to document USAID expenditures on agricultural research, as I found that no comprehensive data of this type has been published for 20 years. (The last report containing such data was issued by the National Research Council in 1977.) It did not take long to understand the reason for this gap, as tracing data on research projects and expenditures for individual country programs proved extremely difficult. Though this required some persistence, compiling this data may be a major contribution of the review.

In the review, the decline in funding for USAID agricultural research programs was immediately obvious. The paper attempts to

quantify the level of research funding and its trend over time. Special attention is paid to quantifying data on country level programs, as my approach is admittedly from a USAID Country Mission and host country research institution perspective and USAID-funded research must address needs of developing country partners and must be linked to technology users to achieve development impacts.

In addition to the decline in funding for agricultural technology programs, several other changes in the environment for international agricultural research merit attention. Some of these represent successes in past assistance efforts and some represent renewed challenges facing the world. The paper discusses a few of the major changes that illustrate how conditions have changed and why a new look is required at how USAID supports agricultural technology development. Key to future assistance efforts will be how USAID activities support the evolution of a *global agricultural research network* with sustainable linkages between research partners throughout the world.

A preliminary version of this report was completed in August, 1996 and given limited circulation. In response to comments by re-

viewers, I have modified the text in some places to give more prominence to the section on methodology, noted funding levels for FY 1997, slightly revised estimates for the late 1970s, and added annexes on funding by geographic region and on other USAID funding data. The basic data remain unchanged.

I am indebted to many individuals for insights and help in this review. Special thanks go to: Dana Dalrymple for reviewing and commenting on several drafts; to Dennis Panther

for providing data from his earlier analysis of research funding; to Mildred Blakeney, Kim Burgess, and Rob Bertram for data on funding levels for CRSP and IARC programs; to Peggy Thome (USAID/HR) for staffing level data; to CDIE for assistance with various documents; and to Russ Freed, Wanda Collins, and Tracy Atwood for comments on earlier drafts. I do, however, acknowledge my own responsibility for all errors, misinterpretations, and oversights.

Acronyms and Abbreviations

AC/SI	USAID Activity Code/Special Interest Code	CGIAR	Consultative Group for International Agricultural Research
ACIAR	Australian Center for International Agricultural Research	CP	Congressional Presentation
AFS	Office of Agriculture and Food Security of the Economic Growth Center of USAID's Global Bureau	CRSP	Collaborative Research Support Program
APAP	Agricultural Policy Analysis Project	DFID	Department for International Development (U.K.)
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa	EIARD	European Initiative for Agricultural Research for Development
AVRDC	Asian Vegetable Research and Development Center	ESDAR	Office of Agricultural Research and Extension of the World Bank Environmentally Sustainable Development Vice-Presidency
BASIS	Broadening Access and Strengthening Input Market Systems CRSP	EU	European Union
BIFAD	Board for International Food and Agricultural Development	FFP	Food-For-Peace
CDIE	Center for Development Information and Evaluation	FO	Farmer organization
CG	Consultative Group for International Agricultural Research	FSR	Farming systems research
		FY	Fiscal Year
		G/EG/AFS	Office of Agriculture and Food Security of the Economic Growth Center of USAID's Global Bureau

GATT	General Agreement on Tariffs and Trade	OECD	Organization for Economic Cooperation and Development
GREAN	Global Research on the Environment and Agricultural Nexus program proposal	PACD	Project Assistance Completion Date
GTZ	German Agency for Technical Cooperation	PRISM	Program Performance Information for Strategic Management
HR	Human Resources Office of USAID	PROCI	Program of Regional Cooperation
IARC	International agricultural research center	PROCIANDINO	Andean Program of Regional Cooperation
ICIMOD	International Center for Integrated Mountain Area Development	RARA	Regional agricultural research association
IFPRI	International Food Policy Research Institute	SACCAR	Southern African Center for Cooperation in Agricultural Research and Training
IIAA	Institute of Inter-American Affairs	SAI	Inter-American Agricultural Service
IPM	Integrated pest management	SANREM	Sustainable Agriculture and Natural Resource Management CRSP
LAC	Latin America & Caribbean region	SPAAR	Special Program for African Agricultural Research
NARI	National agricultural research institute	US	United States
NARS	National agricultural research system	USAID	United States Agency for International Development
NGO	Non-governmental organization		
NIS	Newly Independent States		
NRC	National Research Council		
NRM	Natural resource management		
NRMR	Natural resource management research		

Introduction

The Agricultural Research and Extension Group (ESDAR) is pleased to cosponsor this review of USAID assistance to international agricultural research. USAID has been a major contributor to the development of international agricultural programs and institutions, including support to national agricultural research systems, development of agricultural universities, and the establishment of international agricultural research centers. Continued involvement of US research institutions will be critically important to the development of the emerging global agricultural research system.

This review highlights the substantial investment already made in establishing agricultural research capacities in developing countries; the recent decline in US support to international agricultural research; and the importance of developing research linkages and new partnerships for international agricultural research. This defines exactly the challenge for ESDAR and its stakeholders and the Global Forum for Agricultural Research. The various partners in the global agricultural research sys-

tem must develop and test the sustainable research institutions and institutional linkages necessary to meet the need to feed an additional two and a half billion people in the world within the next 25 years and do so without damaging the global environment.

ESDAR has supported this review in the hope that it will provide a basis for better understanding the nature and volume of past investments in agricultural research technology programs and that this may help to guide future investments. We hope also that this may encourage other donor reviews of past experience and future plans for the investments needed to strengthen the global agricultural research system.

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1

Overview and Summary

This paper reviews USAID support to international agricultural research programs and development of "agricultural knowledge systems." This support for technology development has been an important aspect of past strategies for global agricultural development. Development of systems to provide improved agricultural technology is recognized as one important component of the total assistance efforts needed to transform developing country agriculture and increase productivity and revitalize rural economies.

The paper quantifies past USAID research investments and trends and notes changed circumstances affecting current programs. Past funding for research was estimated by identifying projects supporting technology development or research institution building and then estimating the funding for these research-related activities by year. The estimate includes costs of research programs, university development, research capacity building, research components of larger projects, and technology adaptation and introduction, but does not include funding for agricultural extension or PL-480 food assistance funding for technology programs. Total USAID funding for 587 identi-

fied research activities from 1952 through 1996 is estimated at \$3.62 billion.

It comes as no surprise that USAID support to international agricultural research has declined in recent years. From 1985 to 1996, total USAID support to international agricultural research decreased by 66 percent; support to national agricultural research systems decreased by 71 percent (and appears poised to disappear entirely); and USAID technical agricultural staff numbers decreased by 66 percent. These declines, which may be understated, come as research systems face increasing challenges in responding to economic restructuring and environmental limitations on production systems.

In meeting these new challenges, additional funding alone is not enough. Conditions for international agricultural research have changed dramatically in many countries and, although reversing the decline in funding for research programs is necessary, research institutions will also have to redesign programs and approaches to better respond to client needs and market-driven opportunities. Research programs must seek to become more results-oriented and efficient, especially through link-

ages with other local, regional, and international technology development and dissemination programs. Such linkages are developing and provide the structure for an emerging global agricultural research system. The key institutions in this global system, and the institutions most challenged in adapting to new circumstance, are the national agricultural research systems (NARSs) of developing countries.

If USAID is to be a significant force in supporting sustainable rural development, there is need for new commitments to develop the partnerships necessary for a global agricultural re-

search system. Recommendations for effecting such commitments include:

- a renewed emphasis on NARS development;
- a continued commitment to collaborative activities with other donors;
- an expansion of US professional involvement in international agriculture;
- pioneering of sustainable financing mechanisms for international agricultural research; and
- recognition of a commitment to global agriculture in the form of a new strategy statement on support to agricultural technology systems.

2

USAID Focus on Agriculture

Since the beginning of US foreign assistance programs, agriculture has been an important sector of activity. This dates back to such programs as the Institute of Inter-American Affairs (IIAA) and its Interamerican Agricultural Services (“SAIs”) in Latin America in the 1940’s. Even during the period when foreign assistance followed an industrialization strategy and trickle down economic theory, the agricultural sector received considerable attention. This was conditioned by the recognition of the large and impoverished rural populations and the predominant place of agriculture in most developing country economies and by US pre-eminence in global agriculture backed by a fairly strong and sympathetic rural constituency for foreign aid.

Development theory supports a focus on agriculture, recognizing contributions of the agricultural sector to economic growth through: production of food; production of raw materials and provision of capital for industrial development; release of labor to non-farm activities; employment for growing populations with increased rural incomes to generate demand for non-agricultural goods and services; and agricultural exports to generate foreign exchange needed to pay for other imports. Countries with

good agricultural growth rates have generally experienced higher overall economic growth and reductions in percentage of population in poverty. Technological innovation has been one of the major factors influencing overall agricultural sector growth.

USAID activities related to agricultural technology have gone through several stages:

- *Extension phase of the 1950s and 1960s.* During this period, there was somewhat of an implicit assumption that US agricultural technologies and methods were in hand and could readily be transferred to the developing world. These hopes, though realized in some cases, were largely dashed on the realities of developing country agriculture.
- *Initial research phase of the 1960s and 1970s.* Following the general failure to transplant technology from the US to developing countries, USAID and other donors began to devote more attention to developing appropriate technologies and agricultural strategies for developing countries. In 1962, USAID initiated a research program with special budgetary support, but through the 1960s and into the 1970s, research funding was constrained by congressional limitations

on funding for research activities (NRC, 1977). The Green Revolution signaled a breakthrough in production technology for relatively high potential areas and encouraged further investment in agricultural research. As a result, in 1971, the Consultative Group for International Agricultural Research (CGIAR) was formed to support international agricultural research on major food crops and in 1976 BIFAD (Board for International Food and Agricultural Development) was formed to help bring US university research capacity to bear on problems of developing country agriculture.

- *Maturing research phase of the 1980s.* This period reflected a growing understanding that Green Revolution technologies had achieved the easy opportunities for productivity increases and that more extensive research was needed to maintain these gains and further increase productivity. More location specific research, especially farming systems research (FSR) work was emphasized and donors funded considerable expansion of developing country national agricultural research systems (NARSs) and of the international agricultural research centers (IARCs).
- *Sustainable agriculture phase (or declining phase).* The 1990s saw the completion of many institutional development activities at the country level. Local capacity was in place, though perhaps not fully meeting expectations, and USAID was seeking new approaches to ensure sustainability of development efforts. Agribusiness projects were designed to promote greater private sector involvement in development; environment and natural resources management was recognized as critical to maintenance of a sustainable base for agricultural production; and policy projects began to address policy disincentives to agricultural growth. At the same time, development assistance resources were reduced with the end of the Cold War; the US and other governments undertook widespread budgetary cutbacks; and aid fatigue became widespread. Relatively high world food stocks and low prices and disinterest in agriculture led to a sharp drop in USAID funding for agriculture and agricultural research.

Overall, since the beginning of the US foreign assistance program, agriculture has been recognized as a key sector for growth and improved technology has been an important strategy for generating that growth. Though Cold War politics interfered with the effectiveness of development assistance, in many ways, agricultural development efforts have been dramatically successful. Compared to the mid-1950's, world agriculture now feeds an additional 3,000 million people (Tribe, 1994) and, since 1970, the number of food insecure people has declined by 150 million (IFPRI, 1995). Much of this accomplishment can be credited to agricultural technology systems, which arguably have produced or contributed to, not one, but four "green revolutions." The first being the well known introduction of chemical fertilizer and fertilizer-responsive, high-yielding rice and wheat; the second, the gradual replacement of initial varieties, with a large number of newer varieties, resistant to pests or diseases and suited to specific areas; the third green revolution, being the liberalization of trade and government policies to spur increased production; and the fourth, now underway in improving conservation and management of natural resources.

A CDIE review of USAID agricultural development projects looked at five basic types of agricultural development investments: policy reform, technology innovation, rural infrastructure, agricultural services, and tenure arrangements (USAID, 1996). The review concluded that, though the various investments have produced mixed results, technology projects have had a generally high economic rate of return and are essential for sustained economic growth. An appropriate policy environment to provide incentives for technology adoption and production increase is a necessary condition for agricultural growth, though this may be difficult for USAID to influence. The study's finding regarding the relative success of agricultural research projects is supported by a large number of studies from various regions that indicate a generally very high economic rate of return to investment in agricultural research (Echevarria, 1990; Oehmke, 1995).

3

Methodology for Review of USAID Funding for Agricultural Research

This review is only the latest in several attempts to document past trends in USAID funding for agricultural research activities. This documentation is made difficult for several reasons. USAID has no standard and centralized accounting for past expenditures by category of activity. Records of earlier project and non-project activities are incomplete. There is no standard definition of research and definitions used for activity codes have changed over the period since they were introduced. There is little consistency in projects and research has often been included as a component of a larger project agenda. Data on PL-480¹ and non-project activities is incomplete to non-existent. Nevertheless, considerable information is available through USAID's Center for Development Information and Evaluation (CDIE) and this information is thought to pro-

vide a fairly good indication of levels of past research investments.

Information on past USAID projects was obtained through a search of the CDIE database for projects related to agricultural research. The initial search turned up 459 project activities supporting research over the period 1952 through 1995. This listing was compared to that from an earlier review completed by Dennis Panther, G/EG/AFS. This resulted in identification of approximately 48 additional projects. The data on this combined set of projects was then supplemented with more detailed information on funding for the Consultative Group for International Agricultural Research (CGIAR) and the Collaborative Research Support Programs (CRSPs). The final result was information on 587 project activities.

¹ Substantial amounts of PL-480 local currency generations have been used in many countries to provide local counterpart funding for research programs supported by USAID (e.g., Sri Lanka, Bangladesh) and other donors. This has helped meet pressing current needs, but may have made research system funding even more donor dependent. To a lesser extent, PL-480 funds have also been used for direct project costs of technology projects (e.g., Nepal, many NGO projects).

The review focuses on investments in the technology generation activity part of the "agricultural knowledge systems." This was taken to include research and research capacity building, including development of agricultural universities, most of which are charged with involvement in agricultural technology development. Extension program funding was excluded to the extent possible. However, technology dissemination activities were often associated with agricultural research investments and funding for extension was often difficult to disassociate from research. Also excluded were projects or project components directed mainly at agricultural policy development or at agricultural data collection. Conservative estimates were made for the technology development components of agribusiness activities.

Projects in the resulting data base were then coded as to the focus of activity at the national level (363), regional level (70), or global level (154). Projects were also broken out as to those with full funding for research (207), partial funding for research (337), or funding for university development (43). Projects were also categorized by geographic area, as to Africa (175), Asia (101), Europe (2), Latin America (113), Near East (42), or Global (154). Annex 6 provides a breakdown of funding by region and by year.

Funding for the research project portfolio was estimated based on the data from the CDIE database. This provided levels of funds authorized and fiscal years of obligation. In the case of the IARCs and CRSPs, funding data was based on actual obligations, as per information available in the AFS Office. For multi-year projects, obligations were assumed to be spread equally over the years of obligations for the projects, though the years of obligations themselves had to be estimated in some cases. For projects with partial fund-

ing for research components, an estimate of the level of funding for research was made based on the prominence of the research agenda in the project and on experience with past project budgets and designs.

The resulting data should provide a reasonably accurate picture of the over-all status and trend in USAID agricultural research funding over time. However, this should be considered only an estimate of the funding for agricultural research, as the data is subject to errors due to: a) incomplete CDIE data, especially in earlier years;² b) errors in the CDIE data; c) difficulty in estimating the portion of project funding for research for those projects in which research is only one component of the project; and d) assumption of funding being provided equally over the period given for project obligations.

It is likely that this database has omitted many smaller activities (i.e., NGO projects) with activities involving technology generation and has missed other projects with small research support components. This would therefore tend to under-estimate total USAID support for agricultural technology generation. It should be recognized that, for country programs, a substantial, and possibly major, portion of this funding has been for investments in capacity building for developing country research institutions. An undetermined proportion of this funding has been for actual operational costs for research.³

In recent years, USAID has attempted to better quantify allocations of development funding. The Agency has collected Activity Code and Special Interest Code (AC/SI) statistics on funding obligations for research and other development activities for the years 1989 to 1996. Though this systematic data collection effort is useful, the SI Coded data (Annex 7) differs significantly from the levels of USAID support to agricultural research estimated in this paper. Differences are at least partially explained in

² A few known projects prior to 1970 did not show up in the project list and the 43 university development projects identified are probably not a complete listing, though other university projects may not have involved research activities.

³ The IARC and CRSP programs are principal exceptions, as funding for these programs is, to a much greater degree, focused on operational research costs. The relative importance of these funding categories has increased in recent years, as country-level program funding has declined.

that: much agricultural research would be coded to other research categories, the coding may miss research components within larger projects, some institutional development activities (such as university development) would not be included, and some institutional development costs (including training) are not included. The AC/SI data is collected to conform

to standardized USG definitions for types of research, while data for this paper is to estimate both total and trends in USAID support to international agricultural research. Due to the different procedures for estimating funding and the different purposes for their collection, care must be used in any direct comparisons of these data sets.

4

Trends in USAID Support for Agricultural Research

This section of the review looks at trends in USAID funding for agricultural research-related projects, surveys current program strategies, and reviews changes over time in USAID technical staffing in agriculture.

Trends in Funding for Agricultural Research

This review results in an estimate of \$3.622 billion for total USAID authorized funding for agricultural research between 1952 and 1996. The total authorized funding for this set of 587 projects⁴ (including the non-research components) was \$6.989 billion. This indicates the importance of the technology development programs in supporting broader sector development activities.

Funding levels include both loan and grant funded activities. Earlier bilateral projects included a considerable portion of loan funding, accounting for 51 percent of \$85.9 million of research-related activities funded in the early

1970s (NRC, 1977). Regional and global programs, including international agricultural research centers (IARCs) and Collaborative Research Support Programs (CRSPs), are grant-funded and, from the late 1970s, bilateral program funding has also shifted from loan to grant funding.

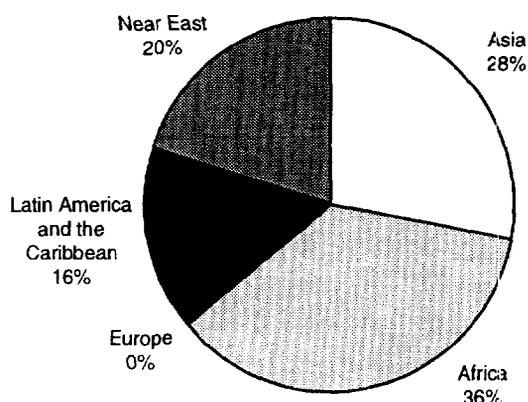
Positive impacts of research funding are not considered here, as these are well documented by the many studies indicating outstanding returns to investments in agricultural research.

Figure 1 presents estimated USAID research project funding by geographical region and Table 1 presents funding by region and type of project for the 1952 to 1996 period.

The recent precipitous decline in USAID funding for agricultural technology generation is well known. Figure 2 presents this trend in funding for the period from 1952 through 1996. Data prior to 1977 may be incomplete, as activities were not fully "projectized" and reporting was not consistent.

⁴ Note again, these are research-related projects and not all USAID-funded agricultural projects.

Figure 1. Geographical breakdown of USAID funding for agricultural research (1952 to 1996)



Note: Excludes funding of global programs.

Figure 2 shows estimated funding separately for country programs focused on development of national research systems (NARSs), country level university development programs, international agricultural research center programs⁵ (IARCs), collaborative research support programs (CRSPs), and other global research-related programs. All programs exhibit declines in funding, though this appears most extreme in support for NARSs and developing country universities.

CRSP and IARC funding levels increased somewhat from FY 1996 to FY 1997 (for CRSPs from US \$17.46 million to US \$17.54 million and for the IARCs from US \$22.45 million to US \$26.35 million). Data for FY 1997 are not presented in charts and tables, as the status of country program funding is less clear due to management changes within USAID and the move to funding and reporting on activities on a "strategic objective" basis rather a project basis. Anecdotal evidence would indicate that country level funding for research activities has continued to decline.

The trend in the number of agricultural research project starts is shown in Figure 3. The declining number of project starts reflected here is largely due to the decline in number of country and regional projects supporting the NARSs. As the earlier projects end, USAID funding for NARS programs will end and may become insignificant within two to three years. This retreat from funding for national agricultural research system (NARS) development may be partially explained by the completion of initial institution building efforts. These efforts have not, however, been consistently followed up with support for operational costs of research and the important maintenance level institutional strengthening needed as the NARSs develop.

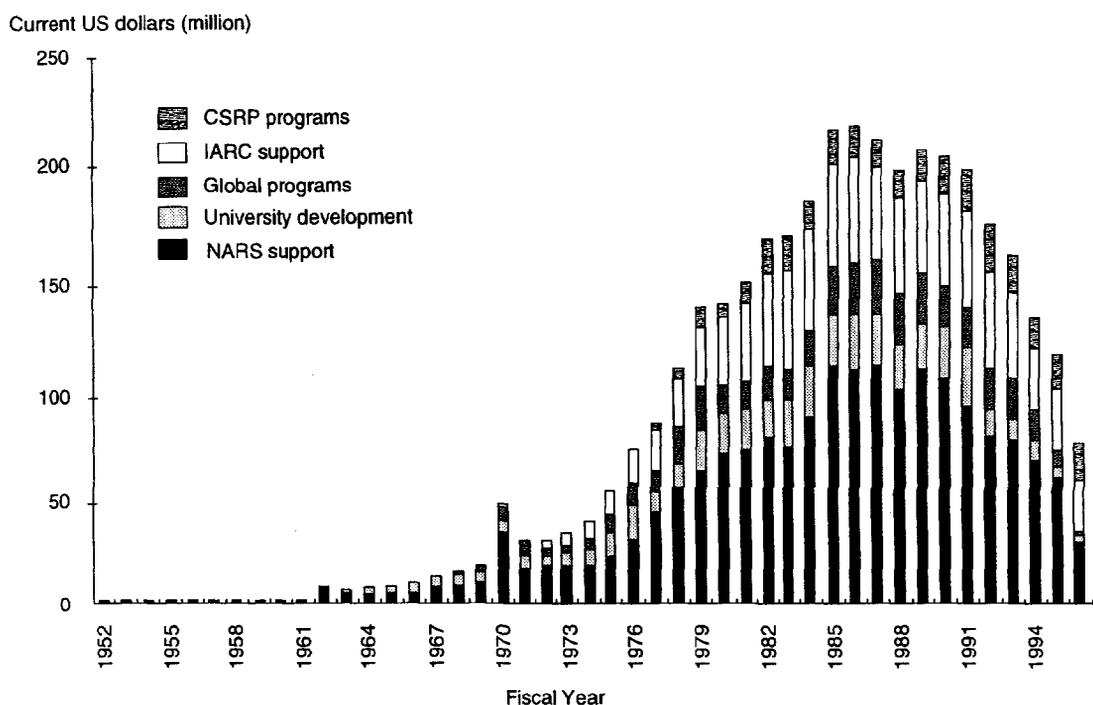
Table 1. USAID Funding for Agricultural Research By Region and Type of Project, 1952–1996
(US Dollars Million)

	Total projects		University development		Research projects		Research components of agricultural projects	
	Number	Value	Number	Value	Number	Value	Number	Value
Africa	175	807.70	14	77.10	53	389.00	108	341.60
Asia	101	601.80	15	163.70	25	244.20	61	193.90
LAC	113	346.10	5	51.20	18	70.30	90	224.60
Europe	2	4.70	1	1.20	—	—	1	3.50
Near East	42	432.70	7	122.30	6	215.80	29	94.60
Global	154	1,429.12	1	40.40	105	1,242.12	48	146.60
Total	587	3,622.12	43	455.90	207	2,161.42	337	1,004.80

Note: Funding for total for projects, some of which extend beyond 1996.

⁵ IARCs include both the international centers associated with the Consultative Group for International Agricultural Research (CGIAR) and non-CG centers, such as AVRDC, ICIMOD, and others.

Figure 2. USAID funding for agricultural research (1952 to 1996)

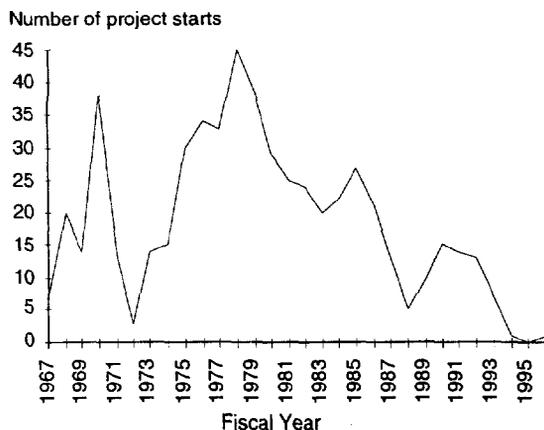


The trends in funding shown here reflect many factors, including significantly the “donor fatigue” in funding agricultural research. This decline in funding also represents a missed opportunity to follow-up on earlier investments in capacity building and facilitate the

application of this capacity to addressing critical development problems.

The decrease in funding is, of course, more severe than is indicated by the current dollar amounts provided for research. Figure 4 presents the trend in USAID funding for agricultural research from 1973 through 1996 in terms of constant 1987 dollars. This more accurately illustrates the severe decline in funding for agricultural research.

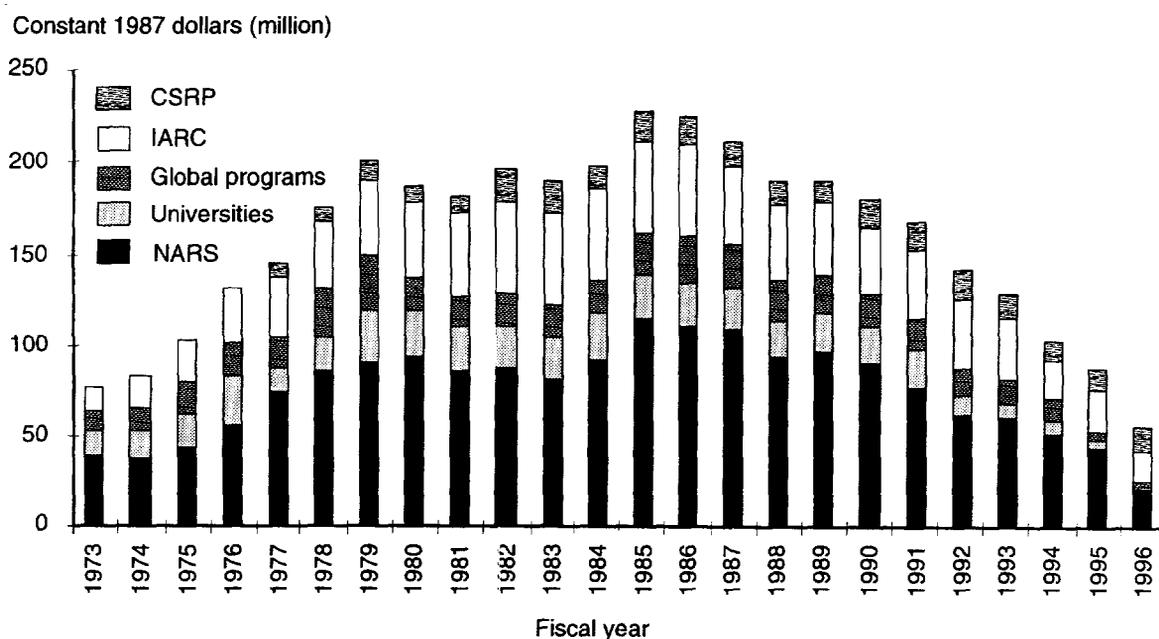
Figure 3. Number of agricultural research-related project starts by fiscal year (1967 to 1996)



In 1997, there have been several initiatives to reverse the decline in funding for agricultural sector activities in general and technology programs in specific. Results from these initiatives have not yet shown impact on funding levels.

Review of Current USAID Portfolio

Current areas of USAID involvement in agricultural knowledge systems were identified through review of Mission program summaries for 86 countries in the FY 1996 Congressional Presentation (CP). This review focused on the 254 strategic objectives for the individual country programs. Out of this total, 106 were di-

Figure 4. USAID funding for agricultural research from 1973 to 1996 (constant 1987 US\$)

rectly or potentially related to agriculture and natural resources. The review did not consider activities of regional or global offices.

This review has limitations in that there is considerable flux in country program strategies. Much of this is due to adjustments required by reductions in funding levels, but the country missions are also still responding to changes in USAID's over-all priorities and strategy statements are evolving from project-based activity descriptions to PRISM (Program Performance Information for Strategic Management) strategies to strategic objectives in the results framework of the re-engineered agency. The Congressional Presentation summary lacks significant detail on the individual strategic objective activities.

This overview from the FY 1996 CP does indicate significant remaining country Mission activity in the agricultural/natural resources sector. However, relatively little of this activity is directly related to agricultural technology generation and the agricultural knowledge systems. Priorities are: agricultural sector policy, natural resource management (NRM), and agribusiness development. Table 2 summarizes the review of country programs.

USAID Regional Bureau Strategies

Interviews with USAID regional bureau staff provided an additional perspective on current regional and country mission programs and priorities as relate to agricultural development and agricultural knowledge systems. These interviews in 1995/96 confirmed the current lack of priority for these development issues and are briefly summarized as follows:

- *Africa Bureau.* Of the 30–35 countries in Africa in which there were USAID programs, eighteen have significant agricultural program activities. Only four (Mali, Kenya, Uganda, Senegal) had bilateral research projects. Promoting regional agricultural research associations is an important element of the bureau strategy.
- *Asia/Near East Bureau.* Little, if any, priority was given to agricultural research in the current project portfolio. Agribusiness projects were on-going, but ending, in a number of countries (Jordan, India, Nepal, Sri Lanka, Indonesia, Philippines). Environmental issues are important in many of the countries and agricultural policy is important in several of the countries that are seen as nearing

Table 2. USAID Mission Programs With Major Focus in Agricultural Area, FY 1996

<i>AFS Technical Area</i>	<i>Africa</i>	<i>Asia/Near East</i>	<i>Europe/NIS</i>	<i>Latin America</i>	<i>Total</i>
Marketing ^a	5	1	—	—	6
Policy ^a	9	8	3	5	25
Agribusiness ^a	5	7	8	5	25
Natural resource management	7	4	—	7	18
Research/extension	7	3	—	4	14
Institutional development	1	—	1	—	2
Land tenure ^b	—	—	5	1	6
Irrigation/water management	—	3	—	—	3
Food security ^a	4	—	—	3	7
Total	38	26	17	25	106

a. There is considerable overlap in areas of policy, marketing, agribusiness, and food security policy/planning.

b. Land tenure carries more prominence than indicated here due to its importance in relation to natural resource management.

“graduation” from USAID assistance. Egypt has continuing support for agricultural research.

- *Europe/Newly Independent States Bureau.* There was little focus on agriculture in the program in Europe and the newly independent states. Albania was a special case and had a significant agricultural program. Agribusiness development is important in several of the countries and privatization policy and assistance for transition to private farms was recognized as important to future development. There were no major projects with research institutions in the NIS.
- *Latin America/Caribbean Bureau.* Funding of agricultural research activities in the Latin America and Caribbean Bureau is almost completely ended. A recent study had assessed the technology and technology institution needs to respond to the demands of hemispheric trade liberalization. This was seen as a priority area for attention, though it is not clear whether any funding will be available or needed to respond to requirements in the region.
- *Food For Peace Office.* The Food Aid and Food Security Policy Paper identified support to agricultural research as one priority for attaining future food security. There was, however, little funding or support from the Food For Peace program going into agricultural research. The FFP Office also does not take a pro-active approach to programming food aid, but instead

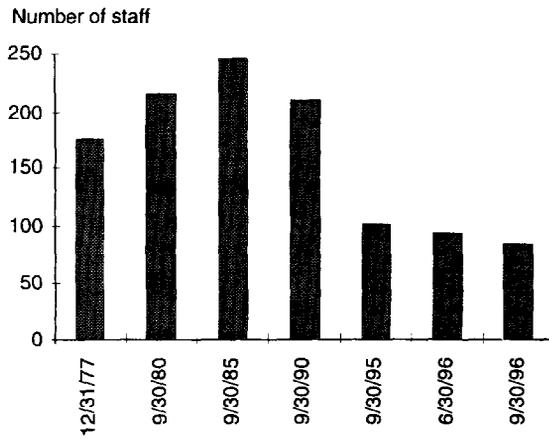
responds to requests from NGOs. Humanitarian and emergency relief programs receive the highest priority. Technology development and other sustainable development activities to address food security problems would seem appropriate for increased priority in the office.

Most of those interviewed considered increased support to agricultural knowledge systems and agricultural research to be important and saw continuing linkages between developing country and US agricultural institutions to be of mutual benefit. Funding limitations prevent any additional consideration to this at present, as other priorities are absorbing all available resources.

USAID Agricultural Staffing Levels

As with the review of past research program funding levels, information on historical USAID agricultural staff capabilities is neither easy to obtain or interpret. Staffing records are not easily accessible; past reviews of staff capabilities are not maintained or easy to track down; and staffing classifications have changed over time. Likewise, staffing assignments have varied as USAID development strategies and implementation procedures have changed. Data is not entirely consistent, either between sources or within source materials. Figure 5 presents the trend in agricultural staffing levels, based on the best available current data from USAID/HR.

Figure 5. USAID agricultural technical staff levels by year



The figure for 9/30/96 is an estimate based on the recent reduction-in-force and the assumption that there had been no hiring or retirement since 3/31/96.

Technical staff numbers show a significant and expected decline. The number of staff (shown in Figure 5) broadly parallels the numbers of established positions over time. These can also be expected to reflect trends in program size and composition.

There is a considerable overlap between the staff backstop categories of "Agriculture," "Rural Development," and "Environment." Staff breakdown by these backstop categories is in-

cluded in Annex 5. The "Agriculture" backstop alone is reflected in Figure 5, as: a) data on rural development and environmental staffing in earlier years is somewhat suspect and may be incomplete and b) environmental backstop staff composition has broadened in recent years and shifted more towards non-agricultural environmental skills.

USAID agricultural staffing has undergone two major shifts over the years. In the late 1960s and early 1970s, staff shifted from direct implementation of rural programs to management of programs implemented by intermediaries. Though data is not available, there would likely have been a significant decrease in technical staff at that time. In the 1980s, staffing assignments shifted from management of the "traditional" production projects to that of broader agribusiness, policy, and environmental programs (USAID, 1991). This shift of technical orientation coupled with decreased staff numbers, greater use of foreign service national staff, and increased reporting and administrative requirements placed considerable demands on the technical staff and reduced ability to provide technical input to programs.

With continued decline in agricultural technical staff, the Agency may soon be in danger of being compromised in its ability to adequately design and manage technical agriculture and rural development programs.

5

Current Issues for USAID and International Agricultural Research Programs

USAID support for international agricultural research is long-standing, but over the last decade, there have been some significant changes in the international research environment, both within the USAID programs and in the broader environment. Some of these, which have major implications for USAID agricultural research activities, are considered here.

Emergence of a Global Agricultural Research System

Observers note the gradual emergence of what is called the “global agricultural research system” (ESDAR, 1995). Though certainly not a formal system and though very much in its formative stage, there is an inter-linked network of international agricultural research scientists and institutions that form this global system. The basic components of this global system are the national agricultural research systems (NARSs) of developing countries, NARSs of developed countries, and international agricultural research centers (IARCs) and programs.

NARSs include governmental research institutes, universities, NGOs, private sector companies, and any other entities active in agricultural technology fields. (See the section on *Increased Pluralism of Research Systems* below for further elaboration on the nature of the NARSs.) Past emphasis in developing countries was often on governmental agricultural research institutes (NARIs), which frequently had—or were assumed to have—a near monopoly on national agricultural research and technology development. Though the NARIs remain important, it is now recognized that NARSs are generally more pluralistic in nature and consist of a range of legitimate, productive institutions involved in the country’s agricultural technology. Developed country universities, research agencies, and NGOs may also be significantly involved in research activities in developing countries.

This global system is in significant ways a product of historic USAID and other donor assistance. USAID provided much of the funding which enabled US scientists to become involved in international work. Many developing country NARSs were assisted by USAID and a large

number of the leading scientists and administrators in the NARSs were trained at US agricultural universities, often with USAID funding. Also, USAID was actively involved with the establishment and expansion of the system of international agricultural research centers.

Within this emerging system, a fundamental structural change in world research capacity is reflected in the growth of the NARSs. In contrast to the situation some 40 years ago, almost all countries now have established national agricultural research institutes (NARIs). In fact by 1985, the number of research scientists in developing countries (82,000 full-time equivalents) had exceeded that of the developed countries (56,000) (Anderson, Pardey, Roseboom, 1994). In 1965, the situation had been the reverse with the developed countries having twice as many agricultural research staff as the developing countries. Some of the NARSs are now quite large and sophisticated, i.e., India with nearly 10,000 full-time-equivalent scientists, Brazil with nearly 4,000, and China with over 36,000 (Pardey and Roseboom, 1989; Pardey, et al., 1991). Though many other countries have much smaller numbers of scientists and many, even in larger systems, are poorly supported and suffer from lack of operating funding, there is now an established capacity (scientists, research stations, laboratories, equipment, etc.) to undertake agricultural research.

At the international level, the IARCs have provided the framework for much of the interaction within the global system. The CGIAR (Consultative Group on International Agricultural Research) network has expanded from four centers in 1971 to 16 in 1996. The Consultative Group itself has expanded from 17 members in 1971, when it was formed, to 54 members in May, 1997. Along with this broadening of membership and capacity, the international agricultural research centers (IARCs) are seeking partnerships with NGOs, private sector companies, and farmer organizations and have embraced a commitment to work closely with NARSs as partners. The IARC research mandate has expanded to include focus on productivity enhancement, public policy improvement, national institution strengthening, protecting the environment, and conserving biodiversity, with

the ultimate objective of impacting on global problems of food security, poverty alleviation, and environmental conservation.

Though there is a global research system emerging from the complementarities and linkages between these various research programs, there is a dark cloud overhead in the form of the current funding crisis affecting international agricultural research. From 1965 to 1985 funding for agricultural research in less developed countries grew in real terms (constant 1980 dollars) from \$1.1 billion to \$3.6 billion (Pardey, et al., 1991). However, in terms of expenditures per researcher, levels fell by 16 percent. Since 1985, there have been severe budget pressures due to decreases in country budgets, as many countries adopted fiscal austerity measures and downsized government programs. Funding problems are accentuated by decreasing levels of foreign assistance and, within many foreign assistance programs, the 1990s have seen a lower priority given to agriculture and agricultural research. USAID is an especially apt example with a decline of 73 percent in support for NARSs (including universities) from \$205 million annually in 1984–86 to about \$56 million in 1994–96. The decline in support for research was also reflected in reduced support to the IARCs and the funding crisis for the CGIAR in 1994. There is strong irony in the fact that budget reductions now constrain research productivity of the NARSs just after extensive investments in institution building have put in place the capacity for productive agricultural research.

There is a further paradox in the fact that, while research has demonstrated a profound impact on the world's ability to feed itself and reduce poverty and while there is a large body of evidence of high rates of returns to agricultural research, decision-makers are reluctant to commit sufficient funding to agricultural research programs.

Current and Future Development Challenges

Global concerns increasingly focus on problems of population growth and future food security, environmental and natural resource degradation, and economic growth needed to reduce

global poverty. These are the concerns of foreign assistance donors. Thus, in light of these concerns, international agricultural research programs have evolved and have sharpened their definition of impact objectives to the "big three"—economic growth and poverty alleviation, food security, and environmental conservation. These objectives are enshrined in the CGIAR mandate, World Bank objectives and various donor strategies. To these can be added an additional benefit from US support to international agricultural development: expansion of US exports.⁶ The challenge in all of these areas has, if anything, increased as the world takes stock of the post-Cold War era and seeks a sustainable development strategy for the world. Much of this challenge is summarized in the IFPRI 20/20 Initiative findings.

- In 1990, 1,100 million people in developing countries were classified as being in absolute poverty (Pinstrup-Andersen and Pandya-Lorch, 1995) and 184 million children were malnourished (Rosegrant, 1995). Without continued investment in agricultural research, there may be little impact on reducing poverty levels and by 2020, a total of 205 million children may be malnourished (Rosegrant, et al., 1995). Agricultural research addresses poverty: a) by increasing productivity in rural areas where 83 percent of the world's poorest of the poor live and b) by reducing food prices for all. By 2020, two-thirds of the population of developing countries will be in urban areas (Serageldin, 1994) and will be greatly influenced by the availability and price of food and other agricultural products.
- Food security is directly and intimately linked to agricultural productivity, to which research contributes. By 2020, world food production must increase by over 50 percent above the level of 1990 (Rosegrant, et al., 1995), while very little—if any—additional arable land will be available, little additional food will be available from the sea, and com-

petition for water resources will leave little additional water for agriculture.

- As evident above, agriculture depends on use of natural resources—land, water, and forests. Technologies and methods are needed for better use and management of natural resources in order to arrest environmental degradation. Priorities include: reducing soil erosion and nutrient mining; more efficient use of irrigation water in sustainable systems; and maintenance of forests and biological diversity.
- International trade expansion can also provide a basis for economic growth and increasing incomes in the US as well as in developing countries. The world economy is increasingly integrated and developing country markets are important to the US, taking 40 percent of all exports and 50 percent of all agricultural exports (USAID, 1995b). Implementation of the GATT, the proposed Free Trade of the Americas Agreement and other trade agreements will require new technologies to exploit new trade opportunities and adjust to changing frameworks for comparative advantage with regard to established products (Bathrick, et al., 1996).

In addressing these challenges, two important considerations frame the current mandate for agricultural research. First, research must address more directly the needs of the poor and must present greater opportunity for equitable economic growth. Balancing the equity and efficiency demands on research will remain a difficult challenge. The second consideration is how to draw on the promise of new technologies in communications, bio-technology, and data management and on the strengths of the private sector to further the agenda of international agricultural research.

Research programs and systems will have to become more client-oriented and more responsive to market opportunities, if they are to maintain support and achieve desired impacts

⁶ Economic growth in developing countries is shown to lead to increased international trade and increased imports. Every dollar invested in international agricultural research generates an average of \$4.39 in additional imports, including \$1.06 of purchases of agricultural products (Pinstrup-Andersen, et al., 1995).

through generation of appropriate new technologies. The economic restructuring underway throughout the world carries with it a need for fundamental changes in the technology support institutions to serve the more commercialized and more diversified agricultural systems (IDB, 1993; Bathrick, et al., 1996). The technology institutions of the NARSs must find their legitimacy and program directions through greater participation of clients in program financing and definition.

The current global priorities define a challenging research agenda. Though framed somewhat differently, in many respects they relate closely to USAID's overall goals of "protecting the environment, building democracy, stabilizing world population growth and protecting human health, encouraging broad-based economic growth, and providing humanitarian assistance." Achievement of USAID goals will not likely be possible without impacts from international agricultural research.

USAID Mission/Country/Program Support Needs

The agricultural research agenda has broadened in recent years, as development strategies evolved based on experience, and as new issues have arisen in development. Although USAID attention has moved away from agriculture and rural development (Section 3 above), a significant number of USAID country program objectives and development strategies still relate to the agricultural sector. The most prominent of these strategies are: agribusiness and private sector development, agricultural policy reform, and environment and natural resources management improvement. Agricultural production and productivity issues are increasingly approached through these strategies.

In many country programs, as the earlier technology projects with the NARIs ended, USAID country programs sought more efficient and flexible institutions through which to promote agricultural development. Agribusiness

strategic objectives, though this number was declining with budget cuts and the ending of the first wave of these projects. USAID has provided a variety of types of assistance to agribusiness development, but most projects involved some form of support for technological innovation. Agribusiness development can be a powerful tool for spurring agricultural transformation. The private sector can introduce substantial technology innovation through direct research and through technology imports, but systems and policies needed to encourage private sector technology development are not yet well established. National and international agricultural research programs must adapt institutionally and in program content to service needs of private sector clients and to capture funding from the private sector.

Inappropriate policies have restricted agricultural sector growth in many countries. Agricultural input and output price controls, trade protection, subsidies, state control of market channels, poor macro-economic policies and other policy distortions have limited incentives for agricultural production and adoption of productivity increasing technologies. Policy reforms may be difficult, but are necessary to provide a basis for lasting improvement in agricultural production. Many countries are currently involved in policy reform and, in 1996, approximately 31 USAID country strategic objectives involved support for policy analysis and dialog. Linked to these efforts is an important need for policy-oriented research to support and guide this policy dialog. Much can be done through consulting or "advisory" services, but developing countries need their own research and analytical capabilities to sustain this work.

Increased emphasis on environmental issues is the most obvious change in development strategy over the past decade or so. In 1996, approximately 27 USAID country strategic objectives involved natural resource management issues related to agriculture, which is both the

human "carrying capacity" without drawing down on the natural resource endowment, as for example by mining soils or water resources, increasing soil erosion, clearing natural forests, or generating pollution. Input use needs to be made more efficient and less polluting. Management systems must begin to account for community-based management and legal frameworks for resource use. Natural resource issues require new research approaches and longer-term perspectives.

Natural resource management issues have always been a part of the agricultural research agenda, but have had far too little priority. Change has come with new natural resource management (NRM) programs; new CRSPs for IPM, Soils, and Sustainable Agriculture and Natural Resource Management (SANREM); and the expansion of the CGIAR mandate to accommodate major emphasis on natural resources. This emphasis must continue and must be extended more fully into the programs of the NARSs, where, in fact, most of the work must be done at the local level.

Increased Pluralism of Research Systems

From the initial development assistance programs in agricultural research until the early 1980's, donors and host governments alike saw NARSs as essentially synonymous with national governmental agricultural research institutes (NARIs). There has been, since then, a growing realization that other agencies have important roles to play in agricultural research and that all solutions will not be found in governmental research institutes. Private companies, universities, NGOs, private foundations, farmer organizations, and other institutions have important roles in funding or carrying out research. This revised understanding is only gradually finding impact in developing countries, as research systems become more open and pluralistic. This evolution, which may lead to more effective and sustainable systems, is facilitated by the increased numbers of qualified staff and improved capability within the NARSs.

Farmer organizations (FOs) are emerging as an important participant in national agricul-

tural technology systems. FOs may play many roles in promoting farmer interests and have been very effective in the US and other OECD countries. In the developing world many past attempts to establish producer cooperatives have been less than fully successful. However, renewed emphasis on participatory development, a global shift towards democratic political systems, and—perhaps—increased education and economic freedom for rural peoples may now provide a basis for more active and sustainable FOs. These organizations in some countries are funding research directly or are providing input into direction of research. Such activities should be encouraged. More generally, FOs can become more involved with technology trials, technology dissemination, and natural resource management work. The FOs are an important research-client linkage mechanism and will see more attention in future development efforts.

Developing country universities are also emerging as a key component of NARSs. Universities are important for their existing capacity to undertake research, including multidisciplinary research, and for the stability they can provide by incorporating research activities within their existing budget and teaching program. Universities play another essential role in training future scientists to staff technical programs. USAID early recognized the importance of university development programs and funded 63 university development projects in 40 developing countries (Oehmke, 1995). This commitment has weakened over recent years, but the need is increasingly recognized by the World Bank and other donors.

As at the country level, internationally the agricultural research system is becoming increasingly diverse. Regional agricultural research associations (RARAs) are emerging as important actors in the global research system; private companies are increasing their international agricultural research and technology transfer; and the global economic expansion provides stimulus for a wide range of international linkages.

Research program administrators and funding entities now recognize the importance of greater participation of clients in planning and

funding research. The British Department for International Development (DFID) has found that poor project design, inadequate user participation, and lack of strong user constituencies are often the reasons for failure of research projects to produce useful results (Edwards and Farrington, 1993). Germany's development assistance program (GTZ) also recognizes the importance of promoting "participatory agricultural research" (Preuss and Steinacker, 1995). These examples reflect the current widespread attempt to introduce demand-driven approaches to agricultural research and to establish closer client linkages and more attention to the dissemination and impact of research. The mechanisms for effecting this are not yet well established and the reform is made more difficult in that it challenges the elitist and/or independent nature of many research institutions.

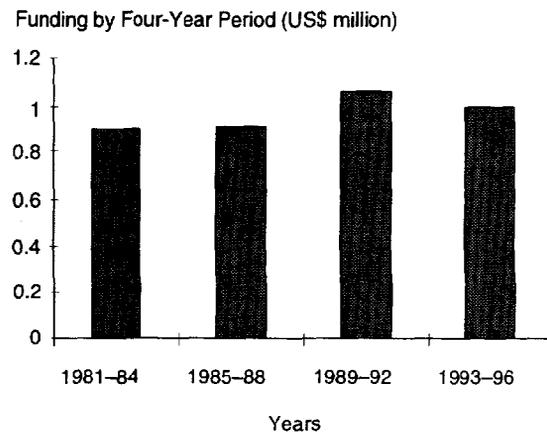
The changed concept of a NARS and the changes necessary to increase efficiency, impact, and sustainability of the international agricultural research system will require major efforts to restructure and organize research institutions and operations.

Donor Support to Agricultural Research

As illustrated in Section 4 above, USAID is in danger of becoming a minor player in its support to international agricultural research. Other bilateral donors have reportedly followed this same trend,⁷ as have regional development banks, though the World Bank has increased its support to agricultural research (Figure 6). For the period 1993 through 1996, the World Bank provided an average of \$195.1 million per year for NARS research programs and \$43.8 million per year for the CGIAR. The World Bank is becoming the pre-eminent donor supporting agricultural research.

The problem that arises in this is that the World Bank and other multi-lateral develop-

Figure 6. World Bank lending for agricultural research, 1981 to 1996



Source: ESDAR database.

ment banks are not the "best" donors for all needs of agricultural research systems. The banks have two advantages: a) they can provide sizable amounts of funding for large projects through their role in wholesaling development finance, and b) they can use their prestige and considerable influence to address policy issues, establish priority for research within the broader national development perspective, and—within limits—coordinate various donor activities.

The Banks are not well positioned to provide the other assistance needed for research system development. It is very often difficult to negotiate sufficient and sufficiently flexible technical assistance and training into loan funded projects, and this is essentially the only funding available from the banks. Developing countries often view technical assistance and training as expensive inputs, which do not produce impacts that are sufficiently immediate or obvious to warrant spending of loan funds. Bank staff are further constrained in the time available for project supervision, especially for review and input into the technical operations of technology programs. Introducing changes to projects

⁷ Data on trends of other bilateral donors is not currently available. From 1980 to 1984, total donor contributions to NARSs, including USAID and World Bank projects, declined by about ten percent (Pardey, et al., 1991). Anecdotal evidence would indicate that declines continued, though there has been significant change since 1995. The World Bank has launched a Rural Action Plan and the EU has a new European Initiative for Agricultural Research for Development (EIARD).

already underway also can be difficult. In addition to limitations of time for project supervision, the workload and limited staff numbers make it difficult to draw on bank staff to provide all of the specialized assistance needed to address specific issues of research organization or technical content. In addition, use of Bank staff or the limited project-funded technical assistance is not always an effective means of providing long term assistance or promoting long term linkages. For these reasons, bilateral or private assistance to international agricultural research programs is desirable to maximize linkages and provide input and flexible support for institutional and program development, as well as for staff development.

In recognition, both of the above constraints and the inefficiencies of poor coordination of support to NARS programs, the World Bank has led the establishment both of a Special Program for African Agricultural Research (SPAAR) and ESDAR (Office of Agricultural Research and Extension). SPAAR focuses on coordination of assistance to African research programs and ESDAR works more broadly on global coordination efforts. Donor response to both initiatives has been good and USAID has given strong support to both efforts.

International agricultural research linkages are also clearly in the interests of the US. International research can produce technologies that feed back to benefit the US. Examples are plentiful and include rice, wheat, and sorghum germplasm that has impacted on US production. Less obvious are the long term benefits

from improved research due to the experience and insight obtained by individual researchers from work on international programs, which provide different sets of colleagues, environments, and conditions and which provide insights into US agriculture. International research linkages are also of value as an entrée for US scientists into international agricultural programs, trade, and development trends. All of these help the US to maintain its competitive position in world agriculture.

Portfolio Review

As evidenced above, there is a significantly changed environment for international agricultural research programs. Research capacity has expanded and a globally linked system is emerging, but this potentially productive research system is threatened by a crisis in funding and is challenged to establish sustainable linkages with developing countries. The research agenda for international agriculture is becoming more clearly focused on long term global problems and at the same time—in order to effectively impact on these problems—must develop closer participatory linkages to identify and meet clients' needs. Bilateral donor funding has decreased, though needs for assistance in the development of sustainable research systems have not. It is timely, therefore, after some 13 years⁸ for USAID to critically review its portfolio and strategies for supporting international agricultural technology development.

⁸ A comprehensive review of USAID agricultural research projects was completed in September, 1983 (Murphy, 1983). A more restricted recent review (Oehmke, 1995) looked mainly at impacts of research project investments.

6

Assessment of Current Program Activities

This section reviews trends and issues relating to major USAID programs and activities supporting international agricultural research and technological innovation. This covers direct research program funding, but touches also on capacity for technical support to other sector programs.

Most agricultural research programs provide support to NARSs or to NARS-based research, either directly—through bilateral projects—or indirectly—through central and regional programs and international programs. The most sizable support has in the past been through bilateral projects with the NARSs. Bilateral NARS projects (Figure 7) accounted for approximately 50 percent of estimated USAID agricultural research funding over the three year period of maximum USAID support to agricultural research from 1985 to 1987. Since then, NARS support projects have declined significantly both in line with decline of total funding and in their share of funding.

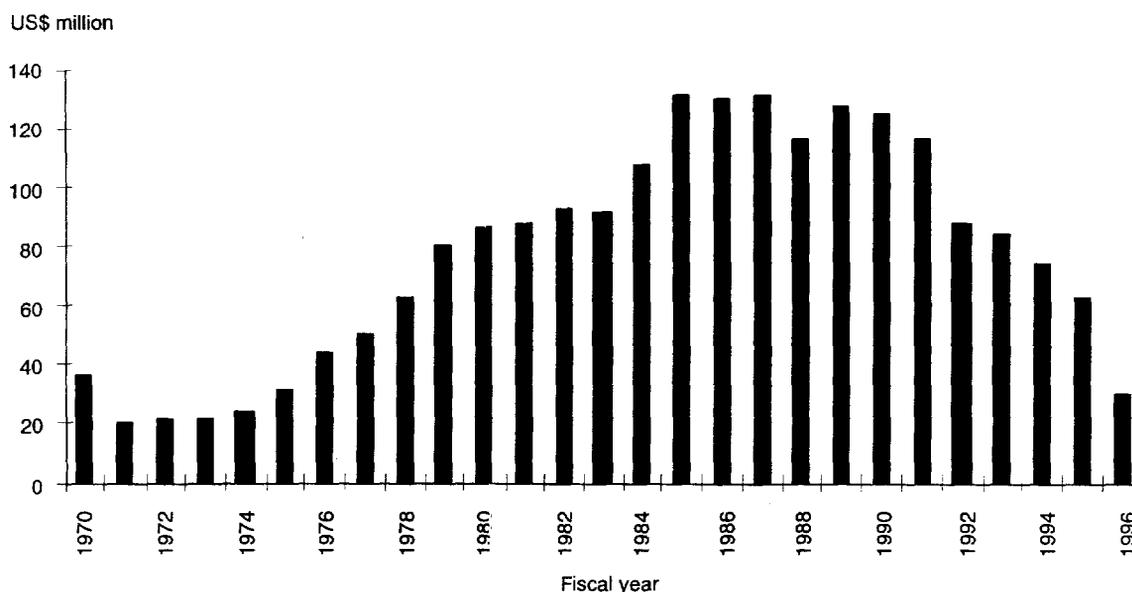
These bilateral NARS projects were invaluable in developing NARS capabilities, as they were of substantial size and provided a comprehensive range of assistance necessary for institutional development. In many cases, the NARS projects may have funded relatively little re-

search per se, but instead directed most funding to development of local research capacity. The projects typically funded construction of research station and laboratory facilities; importation of farm and laboratory equipment and vehicles; long and short term training for research and administrative staff; and technical assistance for project implementation and research program design and implementation.

These NARS projects also played an important role in funding IARC activities with the NARSs and providing a flexible and funded link between the IARCs and NARSs. In the same way, the technical assistance in these projects served as a linkage to the broader range of US technology institutions. Operational funding was frequently included, though somewhat grudgingly, as this was generally seen as a continuing funding requirement for the host country.

The NARSs are the appropriate prime target for international agricultural research funding. Established in-country capacity in agricultural research is important for several reasons:

- Most of the almost 82,000 agricultural researchers working in developing countries are in the NARSs (Anderson, Pardey, and Roseboom, 1994);

Figure 7. USAID funding support to NARS (including support to university development), 1970 to 1996

- Research findings must be adapted to local needs and conditions and must be integrated into local development efforts. The focus of research attention must be on local problems and full participation of clients in planning and implementing research requires close and extensive interaction;
- Natural resource management research (NRMR) and agricultural systems research, which is especially important to small farmers, are receiving higher priority and require special emphasis in tailoring technology to local environmental, social, and cultural conditions;
- Close links with technology dissemination programs (extension services, NGOs, private sector enterprises, etc.) are needed for rapid and successful uptake of research results (Edwards and Farrington, 1993); and
- Farmers and other local clients can provide invaluable input into the technology development process (Preuss and Steinacker, 1995).

For these reasons, the NARSs are essential for achieving desired impacts of international agricultural research. The evolving pluralistic

structures of NARSs offers opportunities to tailor more efficient, sustainable, and results-oriented programs. It also poses challenges for adapting new technologies to developing country uses, for developing new institutional relationships, and for establishing more commercially-oriented technology and emphasizing dissemination and impact. Earlier USAID bilateral projects provided essential inputs into establishing research capacity in developing countries, but perhaps erred in several ways due to project designs and circumstances. The first error may have been in over-funding project designs. Comprehensive support for institutional development was needed and much was attempted over relatively short project periods of five to ten years. These projects typically included construction, organizational expansion, and program development at the same time. In retrospect it has been suggested (Antholt, 1994) that research systems became over-extended with excess buildings and staff and programs that were unrealistic in light of developing country budgets.⁹ Some past projects suffered also in that project implementa-

⁹ While it is now sometimes suggested that NARSs have over-expanded, this argument would be contradicted by the fact that research has been shown to provide extremely high economic rates of return on investment and that there may consequently be a structural under-investment in agricultural research.

tion (and expenditure), not research results, became the focus of activities. Project success was measured by participants trained and buildings constructed rather than by research results delivered to the farmer. Project support was "locked in" once the project agreement was signed and it became an entitlement for the NARI rather than a resource to be used and justified for its contribution in leading to a goal.

The second major failing in the bilateral projects was their abrupt end. At the Project Assistance Completion Date (PACD), all support stopped. Follow-on projects provided some relief, but USAID was never successful in identifying transition programs—for "graduate" countries that stopped needing development assistance; for returning participants that had to reintegrate from US universities into their home institutions; or for NARIs or other institutions that received a high level of support under a project, which abruptly ended. Strong professional relationships were developed between US scientists and developing country counterparts based on experience of individuals trained at US institutions and US scientists who worked overseas. Often, these individual relationships continued after project termination, though formal institutional relationships were more difficult to maintain after cut-off of project funding. Transition support at a lower level would be an important aid in research capacity building, in establishing sustainable programs, and in obtaining high returns on past investment.

NARSs are in need of further support:

- to develop research programs and institutions, a process that takes more than the five to ten years provided under earlier projects. This is especially important as the NARSs struggle to

correct organizational mistakes of the past and develop more pluralistic, inter-linked institutions with market- and client-oriented programs;

- to continue professional development of scientists with limited experience with high-quality, science-based research work;
- to provide financial support to underfunded programs in which past investment in research capacity building will languish without provision for operating funds; and
- to provide scientific and intellectual leadership in emerging fields, such as biotechnology and NRMR, and in new research approaches, such as participatory research planning and implementation.

Regional agricultural research associations¹⁰ (RARAs) are emerging as an important mechanism to strengthen NARS research programs. These regional groupings allow for sharing of research costs and results and coordinated planning for regionally relevant technology development. The associations ultimately depend on strong NARSs and need to be NARS-owned and administered. They should not be taken over by donors or become donor-dependent if they are to be sustainable. The RARAs also represent an opportunity and a means for coordinating support to NARSs on a less intensive basis than through country-specific, NARS projects. The emphasis in RARA programs should be on promotion of regional collaboration and sharing of technologies. There will likely be a wide range of collaborative arrangements that develop under the RARAs.

Thus, the NARSs need to remain the focus of international agricultural development programs. Their capabilities are substantial, but they are faced with two basic problems. First, the NARSs suffer from constraints in operating

¹⁰ RARAs (regional agricultural research associations) vary considerably in form and degree of organizational development. The term refers to the ten to twelve major regional agricultural research associations, including: APAARI (Asian Pacific Association of Agricultural Research Institutes); AARINENA (Association of Agricultural Research Institutes in the Near East and North Africa); CORAF (Conférence des responsables de la recherche agronomique africains) in west Africa; SACCAR (Southern African Center for Cooperation in Agricultural Research and Training); ASARECA (Association for Strengthening Agricultural Research in East and Central Africa); the Latin American PROCIs (Programs of Regional Cooperation), including PROCINDINO, PROCISUR, and PROCITROPICAL; and others.

cost funding. Secondly, there is a danger of intellectual isolation and inbreeding common in almost all developing country NARSs. In some of the smaller NARSs, this is aggravated by a related problem of lack of critical mass of scientists in many disciplines. For the first problem, donors must, over time, help developing countries address their funding problems in sustainable ways. On an interim basis, donor funding of a portion of operating costs is an appropriate and defensible response to this problem in order to develop the technologies essential for long term, sustainable development of the rural sector.

Donors will also need to address the issue of overcoming isolation of NARS scientists and do so by fostering international linkages that will form the network of the international agricultural research system. Linkages will ideally include regional cooperative activities, including those through RARAs, plus collaborative links with scientists in other developed and developing countries. Establishing these linkages will require donor funding, but this donor funding should leverage funds and self-interests of the participants, to the extent possible, in order to be cost effective and have a basis for developing into long term relationships. These linkages will be largely technical exchange, reverting to the approach and terminology of "technical cooperation"¹¹ rather than the terms "technical advisors" and "technical assistance" as have been used over the past two decades. Emphasis will be on developing partnerships and collaborative relationships.

One area of continued support needed for the NARSs is that of advanced degree training, which will be important to NARS development and productivity. Training can be perhaps the most important USAID contribution to NARS development. Overseas training provides an excellent human resource base for research and builds good linkages to US institutions and programs. However, the cost of US training is high and more training will have to be done in de-

veloping countries. This will require renewed attention to developing country universities and the quality of their programs. The importance and potential for impact of training was recognized in an observation by Antholt (Antholt, 1995) that a portion (\$500 million) of the declining USAID budget could be used to fund up to 20,000 fellowship-years of advanced degree training annually and that this would have a substantial impact in providing for future intellectual and technical leadership in developing countries and would forge strong linkages with the US.

Mission/Country Support

Trends in programs, staffing, and operational relations emerge only slowly and are not always easily identified. Within USAID, trends have been both accelerated and obscured by recent funding pressures and preoccupations and by changes in operating procedures. Thus, though there are now clearly new sets of needs for agricultural technologies to support country programs, USAID research programs and projects have been slow to adapt to these changing needs.

Through the 1960's and 1970's, country programs emphasized agricultural production and rural development. Research projects focused on development of NARSs and operation of IARCs. USAID had a fairly extensive set of centrally funded programs—many involving some research support—and was able to draw on these to support country programs. This support was facilitated by active country programs and agricultural staff that could tap into the central projects, either through direct funding of "buy-ins" to the central programs or indirectly through professional contacts.

By the early 1990's, the country program support system was considerably weakened. Country programs had shifted from rural development and agricultural production and, what remained in agriculture emphasized pol-

¹¹ As embodied in the earlier Point Four Program foreign assistance agency names of "Technical Cooperation Administration" from 1950 to 1953 and "International Cooperation Agency" from 1953 to 1961.

icy reform, agribusiness, and natural resource management and conservation. Both country programs and central programs were pressed for funding and had less resources to "reach out" to each other for mutual support. Central research projects were more narrowly focused on research and were, in some cases, restricted from funding dissemination of results. Finally, in the 1990's, consolidation of technical staff from regional bureaus to the Global bureau weakened contacts with and service orientation to support of country programs.

Many changes within country programs have been appropriate moves to emphasize the sustainability of development efforts, though arguably the degree of shift away from production programs has been excessive. While these changes were occurring, USAID Mission technical staffing has been reduced or shifted towards host country national staff. Expertise in the new technical areas of emphasis developed only slowly. Central research programs positioned to learn from country programs, to aggressively share experience, and to provide specialized backstopping would be invaluable to country programs.¹²

USAID programming has, within the severe limitations of declining budgets, adapted to meet some country support needs. The APAP-III has a good track record of providing analytical support for agricultural policy formulation and the Michigan State University "Food Security Project" has provided effective support to African programs. In the Asia and Near East Bureau, the Regional Agribusiness Project has complemented country agribusiness projects. In the environment and natural resource management arena, the SANREM and IPM CRSPs have provided relevant support to some country programs. Furthermore, the new BASIS (Broadening Access and Strengthening Input Market Systems) CRSP should address policy and natural resource tenure issues and

the Livestock CRSP and others are using participatory design processes, focusing on environmental issues, and planning technical support components that should better link these programs to and make them more relevant and useful to country programs and NARSs. This list is not exhaustive, but serves to highlight some of the relevant country program support programs.

Fewer Missions, smaller Missions, and less funding for (costly) technical assistance in country programs will make it more important to develop the commitment and capability to provide technical support to country programs. Basing this assistance on relevant research programs should improve the content and relevance of the technical support and would give feedback for research on the priorities and issues on which research can have practical program impact.

International Agricultural Research Centers (IARCs)

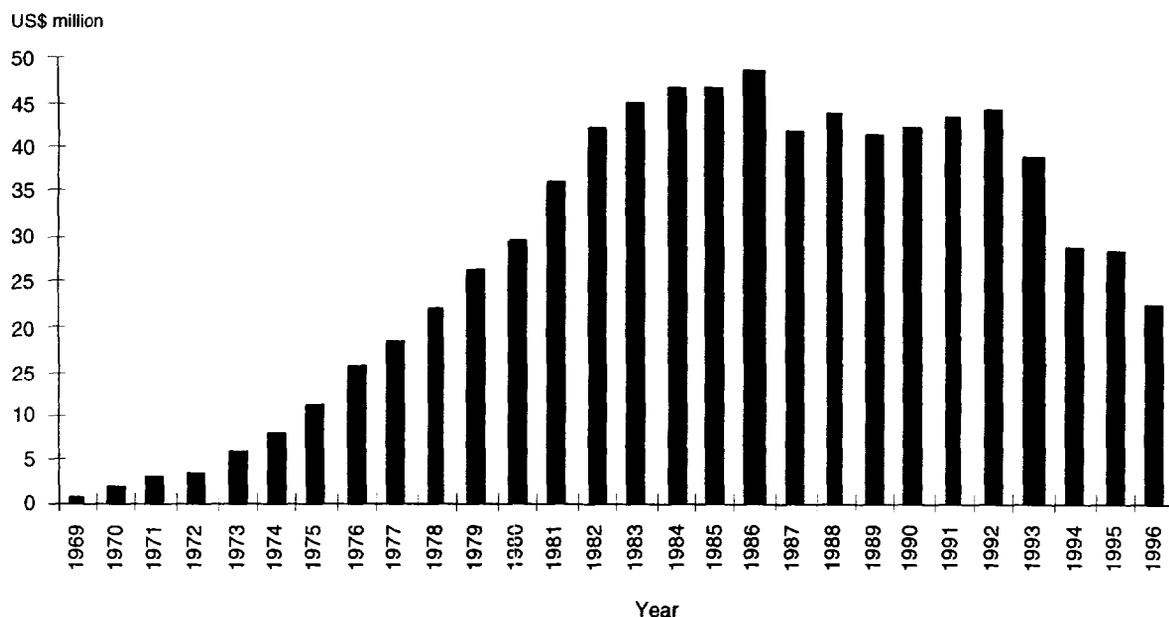
The Consultative Group for International Agricultural Research (CGIAR) is a unique institutional mechanism for support of the IARCs, which may be the glue that draws the global agricultural research system together. USAID was a prime actor in establishment of the CGIAR and of some of the IARCs. With their importance to world agriculture, it is difficult to justify the reduction of USAID contribution from \$43.1 million (17.4 percent of CGIAR core funding) in 1992 to \$22.45 million (7.4 percent) in 1996.¹³ The trend in USAID core funding for IARC programs is shown in Figure 8.

The IARCs and the CGIAR system carry some very strong advantages:

- International programs allow for coordination of donor support and avoid costly duplication of efforts. Without such central coordination, there would likely be much duplication of

¹² Such backstopping has always been available and, in some cases has been excellent, but in practice, it has been difficult to access and has provided inconsistent support to country programs.

¹³ Now increased to US\$26.35 million in 1997.

Figure 8. IARC core funding by year, 1969 to 1996

work, fragmentation of activities, and multiple approaches to the NARSs with resulting high demands on NARS administration.

- International centers allow for economies of scale and scope in supporting and coordinating sizable research efforts under common administration.
- International centers can provide the continuity, which is important to much agriculture and natural resources research. Smaller discrete programs are less likely to be seen as permanent or semi-permanent efforts. At the same time, the long term Center research programs can evolve as past work and new problems point to shifts in research priorities.
- International center research should be especially responsive to needs of developing countries. The centers' mandate to address needs of developing country agriculture provides a focus and the location of many centers in the developing world serves to facilitate increased interaction with NARSs and better understanding of the problems to be addressed.
- International center research is of high scientific quality. International recruitment of

staff, strong peer review systems, international oversight, relatively good research support, and extensive linkages with developing and developed country NARSs combine to encourage quality research.

- The IARCs carry a high level of prestige and a "convening capability" that enhances their influence and the impact of their work. They are a natural vehicle for collaboration on international agricultural problems and issues and their research contacts and international oversight groups provide strong contacts in many countries.
- Leveraging of funding for international agricultural research is, perhaps, the most obvious benefit of the IARCs. The system enables smaller amounts of USAID funding to support much larger programs that would likely be beyond the reach of any one donor. Without the IARCs, some donors would be likely to contribute even less to international agricultural research.

Despite these strong advantages of the IARCs, there are some incipient problems or weaknesses in the system that merit concern.

Sustainability is the first issue for the Centers, especially in relation to the CGIAR. As USAID (and, to a lesser extent, some other donors) has demonstrated, funding commitments may be soft and the sustainability of the system is hostage to the annual budget processes of its donors. In 1996, the \$300 million target for the CGIAR, though perhaps only 2–4 percent of global agricultural research funding, is still a significant funding requirement. The 1994 CGIAR “renewal” process rescued the system from one crisis, but already in 1996 and 1997 there were again financial problems for some centers. Program continuity is important, but is disrupted by financial crises, which also divert management time from other issues and add funding uncertainties that reduce research efficiency for individual programs.

A second issue, somewhat at odds with the problem of sustainable funding, is that of the commodity and geographic coverage of the IARCs.¹⁴ The IARC network has grown on a somewhat ad hoc basis and does not provide comprehensive support to all international commodities. The system does not adequately cover: a) some “orphan” food crops, which may have only local (quinoa, teff) or potential (chayote, yambean, buckwheat) importance; b) some vegetable crops of which there is an almost limitless variety, or c) important cash crops, such as tea, coffee, pineapple, and rubber, which could benefit from international agricultural research.

In representing most IARCs, the CGIAR focus on food crops has been an important way of defining its mandate and of giving the programs coherence and a clear “mission.” Still increasingly, as trade liberalization increases, food security in many areas will be dependent on efficient production of cash crops, which will allow food purchases. Though the IARCs are relatively weak in their support of cash crops, a true global agricultural research system will have to be able to address technology issues for these crops. However, a change in commodity coverage strategy for IARCs could

result in some loss of support from donors, who may base their commitment to research on a production-oriented understanding of food security.

Geographic coverage of the IARCs is a second aspect of this issue and one constrained by funding limits. Within the CGIAR, there is a somewhat deliberate allocation of responsibilities for lead Centers for commodities and for geographic regional work. However, this allocation, leaves gaps in which some eco-regions are not well covered, as for example, Central Asia, since the dissolution of the Soviet Union. The Asian mountain areas are also not represented in the CGIAR, though ICIMOD programs cover this area. A more comprehensive approach to assigning lead centers for eco-regions to complement the commodity programs may provide better and more balanced support to natural resource management and farming systems work, especially in less favorable production environments.

A third issue with the IARCs is that of outreach and linkages to NARSs. There is likely to be continuing interchange on the appropriate division of responsibility for international agricultural research and this is unlikely to be resolved definitively. NARSs have enjoyed relatively good links to IARC programs through IARC outreach programs and through linkages funded by bilateral projects with the NARSs. With the reduction of bilateral NARS projects and the reduction in IARC funding, maintaining these good linkages will be problematic. The CGIAR is taking a major initiative to develop better, systematic linkages to NARSs, but this may suffer from lack of funding or may divert funding and attention away from strategic research—the real strength of the IARCs.

The number of Inter-Center Initiatives, special programs, and new strategic alliances seems to be taxing the CGIAR capacity. Though funding for system-wide programs is capped at 2–4 percent of the CGIAR budget, there is a large overhead cost in managing such initia-

¹⁴ Comments here are made with note of the fact that most, but not all, IARCs are member centers and coordinate programs through the CGIAR.

tives and responding to the varied stakeholder demands. This leads to a danger of growth in bureaucracy and a loss of the flexibility and focus that have been advantages for the IARCs. This problem is somewhat accentuated by the number of donors involved, all with somewhat different agendas and demands. All of this reduces efficiency and focus on research work and is reminiscent of the multiple objectives, which USAID has had (Schuh, et al., 1992) and which served to obscure focus and impact on any core result. Though this problem can not be eliminated, as the IARCs must remain responsive to the priorities of their stakeholders, there is a need to review true overhead costs—defined operationally, not in an accounting sense—and make efforts to maintain focused and efficient programs.

Finally, funding agricultural research through an international institution, such as the CGIAR, is a complex process that limits any one donor's control and influence over the system. The CGIAR requires and has enjoyed a highly collaborative approach to decision-making and has remained largely free of political interference. It is important to US scientific interests to continue this international collaboration under

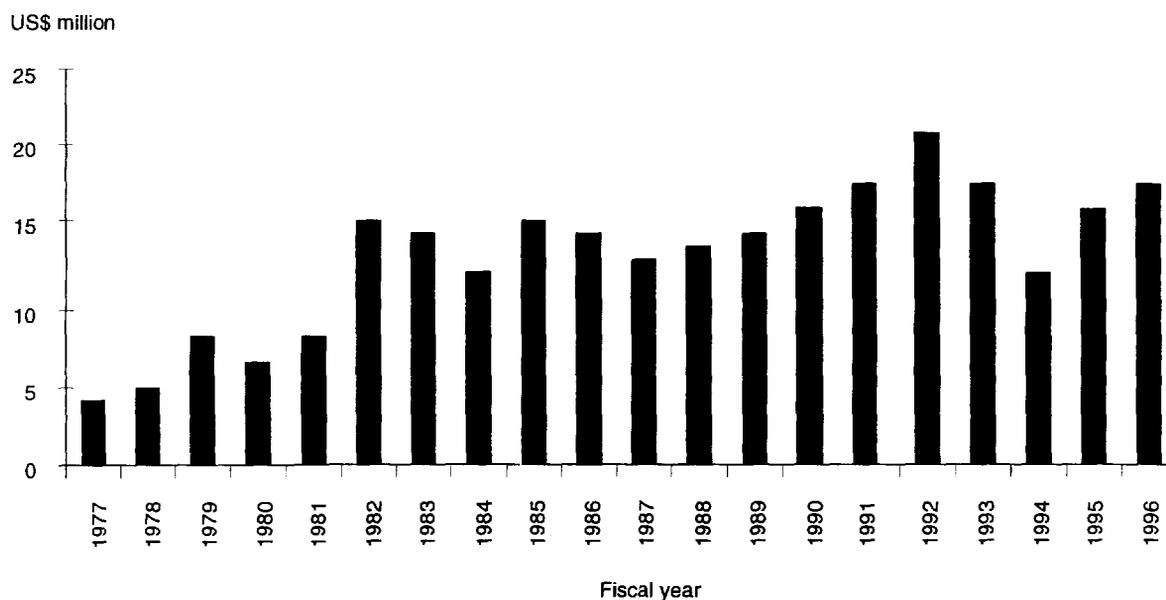
strong and independent CGIAR leadership. USAID funding to the IARCs leverages funding from other donors, but USAID funding reductions could affect somewhat USAID ability to influence priorities and strategies within the CGIAR. It is however in both US and CGIAR interests to maintain strong US participation and an active leadership role within the system.

Collaborative Research Support Program (CRSP)

The CRSP programs were initiated in 1975 as part of the Title XII Section of the US Foreign Assistance Act. Since then there have been a total of 10 CRSPs, of which nine are currently active. Total funding for the CRSPs has been approximately \$263 million (Figure 9) with additional funding provided through Mission and regional buy-ins for specific services. The CRSPs have been involved in activities in 42 countries.

The CRSPs have one overwhelming advantage—the ability to access the wealth of resources within US agricultural universities and bring these to bear on solving problems of developing country agriculture. The scientific

Figure 9. Estimated funding for CRSPs by fiscal year, 1977 to 1996



talent and training capacity in these universities is probably unmatched in the world. Many of these staff are personally committed to international development and have established strong contacts through former graduates now working in the NARSs.¹⁵ The universities, and the legislatures and constituents on which they depend, have some ambivalence towards international agriculture as a potential source of competition, but this is being overtaken by recognition of the need for university programs to develop international perspectives in their programs, training, and graduates.

The research and NARS development activities funded through the CRSPs have proven quite effective (Swindale, et al., 1995). The CRSPs have made a particularly impressive contribution to NARS capacity-building through training of 1700 participants in academic degree programs (Swindale, et al., 1995). The programs also have advantages in that they can contribute to long-term collaborative relationships between US and developing country researchers.

The CRSPs have been admired and copied as innovative models of how to apply university capabilities to international agricultural problems. Formation of the highly-regarded Australian Centre for International Agricultural Research (ACIAR) was influenced partially by the CRSP-model (Tribe, 1994). Other countries are seeking ways to expand involvement of their universities and research institutes internationally. Canada has launched a new "CGIAR-Canada Linkage Fund" Program in 1996 and the European Union is considering a "European Initiative for Agricultural Research for Development" to link European institutions with IARCs and NARSs in collaborative programs.

The CRSP universities are also strong supporters of the program and proud of their involvement and impacts on international agricultural development. The provision that CRSP research must be of benefit to US agricul-

ture provides a strong additional justification for university involvement in work overseas and produces commodity organization support for the program, or at the very least, helps to defuse any opposition. The CRSP program design is much more consistent with normal university academic career patterns than were earlier NARS institution-building programs (Ruttan, 1996).

In contrast, within USAID, the CRSPs have been frequently criticized and have been an occasional cause of friction between country Missions and CRSP programs. The CRSPs, as other university programs, have been hurt by being viewed as "entitlements" rather than as productive use of development resources (Ruttan, 1996).

Much of the criticism is likely due to lack of communication and lack of understanding of the objectives of the CRSP programs. Country Mission programs are under considerable budget pressure and have been moving away from research capacity building activities. They have been required to demonstrate quick results and have, at times, been under pressure to "focus and concentrate" and reduce the number of assistance activities within a country. From the perspective of these pressures, some country Missions have perceived the CRSPs to be: a) conducting research with little attention or linkage to Mission programs or objectives; b) requiring very long lead times for research to produce any practical results; and c) drawing funds from higher priority country programs.

These perceptions demonstrate the need to: a) better communicate the long-term and applied nature of CRSP agricultural research; b) ensure objectivity in programming and allocating funding within USAID strategic objectives and annual budget allotments; and c) develop country activities with wide participation at the country level and with clear objectives for achieving and measuring impacts and results. There needs also to be a clear statement

¹⁵ There is conflicting opinion as to whether or not universities adequately reward staff for international work. In the past, the consensus was that overseas work counted little for university career development. At present, the situation probably varies by university and department.

from USAID to country programs emphasizing the continued relevance and importance of agricultural research to USAID objectives.

In seeking to make the CRSPs a more effective mechanism to promote international development and evolution of a sustainable global agricultural research system, universities and USAID must face two major issues. The first relates to limitations in the breadth of the CRSP programs. Program focus and concentration have advantages and there are real constraints to how much can be done on an annual budget of \$17 million. However, the following limitations place significant constraints on the impact of CRSP research:

- *Commodity programs.* Some of the commodity programs have been outstanding and have produced impressive results. However, the CRSP programs cover only certain commodities and can not support work on the three major food crops of the world (maize, wheat, rice) or on other commodities or problems. There is currently some broadening of focus in the programs, as with the "Small Ruminant" CRSP becoming a "Livestock" CRSP and with the "SANREM" and "BASIS" CRSPs addressing broader policy issues. However, it is still not possible to use the CRSPs to access US scientific talent for commodities not covered by a CRSP mandate (i.e., for barley breeding, tea management, corn breeding, etc.).
 - *Country focus.* The CRSPs generally have specific country research sites and may generate effective technologies for those countries. There are, however, no effective mechanisms, other than buy-ins, which are becoming less likely with shrinkage of country program budgets, for other countries to access CRSP technologies or CRSP assistance in their own research programs.¹⁶ If CRSPs are to address global or regional issues, they need to develop more effective strategies to broaden country networks and collaboration. RARAs may offer one option for wider country collaboration and training of partici-
- *US participation.* The CRSPs have core institutions and individuals—usually selected through competitive processes—participating in CRSP research. This in effect may exclude other scientists and institutions not selected, though there may be significant interest and expertise available that could be brought into the research program on a cost-effective basis, if organizational procedures allowed (Swindale, et al., 1995). The CRSPs reportedly are developing procedures to become more inclusive in participation of US scientists and institutions in the CRSPs and this should be encouraged.
 - *Institutional base.* Though the Title XII institutions are clearly the major sources of expertise for international agricultural research, other universities and private agencies also have much to contribute (Collins, 1996). To their credit, the CRSP programs have made commendable efforts to involve other institutions. However, the CRSP approach is restrictive of involvement of other institutions and should be broadened as far as possible.
 - *Research focus.* The CRSP approach and US universities undoubtedly are best suited to support research and training activities (Swindale, et al., 1995). However, outreach is necessary, and—because of past USAID policy—is probably the weak link in the CRSP program (Furtick, 1989). Without effective outreach and systems for dissemination of results to users, research program impacts may be minimal (Edwards and Farrington, 1993). With no natural outreach mechanism, the conscious decision to focus the CRSPs exclusively on research was probably a mistake. They have done a commendable job of promoting NARS institutional development through training, which combines research with human capacity building, but the CRSPs need to take a more holistic approach to technology innovation.

¹⁶Based on experience with research programs in Nepal, Burma, and Sri Lanka.

A second issue for the CRSP programs is that of ensuring a client orientation and beneficiary participation in CRSP research. The 1995 evaluation of the CRSP program (Swindale, et al., 1995) stated that "a major weakness in the CRSPs with respect to social impact and benefit incidence is that the beneficiary populations were, with some exceptions, not defined and targeted before research activities were designed." This is partially a reflection of the difficulties of planning and managing such programs without long term presence in some of the participating countries.

Expanding the market-orientation and client participation in research is a challenge for all research programs. For the CRSPs, the key to this is likely to be in maximizing NARS involvement in program planning and management. The CRSP program foci have been determined by USAID, probably with some consultation with BIFAD. The amount of host country researcher and NARS input to identification of the CRSP programs and later in review of grant proposals, selection of institutions and cooperating scientists, and participation on Boards of Directors, technical committees, and project management is not well documented.

There is good to excellent collaboration at the country level in work with specific NARSs on country research sites and the relatively long term relationships that have developed are excellent examples of linkages in a global research system. However, there is scope for increasing the demand-drive to guide CRSP research. Though there are real limitations on how to achieve this under current programs, many of the CRSPs seem committed to expanding the base of beneficiary participation and responsiveness to client needs.

The dual mandate of the CRSPs in demonstrating benefit to US agriculture as well as to that of developing countries could complicate the emphasis on the program client focus. The objective of providing US benefit from CRSP research is positive and can generate support for the program (Swindale, et al., 1995), though

this program condition limits the activities CRSPs can undertake, limits their potential impacts on developing country agriculture, and provides grounds for criticism of their objectives. The Title XII legislation (PL-94-161 of 12/20/75) states that programs should integrate "to the extent practicable the programs and financing authorized under this title with those supported by other Federal and State resources so as to maximize the contribution to the development of agriculture in the United States and in agriculturally developing nations." This is not a prohibition on assistance that benefits only developing countries, and benefits to the US are, in fact, easily demonstrated in that international agricultural development produces direct benefits to the US in terms of trade and increased agricultural exports. Much research is also directly relevant to US agriculture and the increased understanding of agricultural systems and new perspectives are of considerable indirect benefit. Nonetheless, as USAID has found with its overall program, multiple objectives can be a serious constraint in focusing programs and measuring results.¹⁷

USAID Technical Staff

USAID technical staff numbers are dwindling¹⁸ along with total staff numbers. Missions have eliminated or sharply reduced agricultural officer positions and regional bureaus have all but eliminated technical staff. Still in order to have a credible and competent agricultural research program capability, it is important to maintain contact with these program operations and with the NARS programs and operating environments. This can not be done effectively without field staff capabilities.

To the extent that they—hopefully—continue to exist, sizable country agricultural programs will continue to require technical staff posted in the host country. Central program management plus policy analysis and technical support staff will have to be based in Washington. How-

¹⁷ At one point USAID was on record as having had 33 objectives and 75 priorities.

¹⁸ This paper was in draft prior to the author receiving a termination notice under a USAID reduction-in-force in June, 1996.

ever, to complement the reduced number of country-based technical staff and to maintain close links with developing country partners, USAID might post regional technical staff to monitor technical programs, manage regional

activities, and maintain contacts with the NARSs and international programs in the region. Such staff could be posted at appropriate IARCs within the region, at offices of RARAs, or at appropriate USAID Missions.

Recommendations

The purpose of this paper is to point out some of the current issues relating to USAID's agricultural research programs and to draw attention to the need for a more comprehensive review. This section provides some general recommendations, but recognizes that further consultation and study is required. However, unless there is a change in the current decline in funding for international agricultural technology programs and a renewed agency commitment to the agriculture/natural resources sector, it is unlikely that a review or a new initiative will be of much value. Still, the agricultural technology sector is of too much importance—to international development, to global priorities, and to US interests—for it to be neglected. In giving new emphasis to the sector, the following general recommendations should be considered:

USAID Should Develop a Strategy for Emphasizing NARS Development in Building a Global Agricultural Research Network

In many countries, there is probably not a need for major bilateral NARS institution-building

projects, as were funded in the past. There are, however, some countries, mainly in Africa, in which NARS institution-building will still require concerted efforts. In other countries, more generally, there remain important needs for:

- work with individual programs and researchers to maintain scientific rigor in research, introduce new technologies and methodologies, and solve specific problems (science);
- help to develop strategies, institutional arrangements, and plans for effective operation of the NARSs (institution building);
- human capacity building in the form of “maintenance” level training and replacement staff training for the future (training); and
- provision—in some cases—of operational funding for technology programs (operating costs).

In order to capably manage such programs, USAID must maintain close linkages and dialog with the NARSs. This may not be possible through a full network of country Missions in

the future, but could be organized on a regional basis, at the level of the regional agricultural research associations (RARAs). NARS support might also be funded through regional programs, which could coordinate input to individual NARSs through sub-grants and activities.

USAID Should Continue Collaboration with Other Donors to Leverage Resources in Development of the Global Agricultural Research Network

The multi-donor initiatives in ESDAR (the Agricultural Research and Extension Group at the World Bank), the Special Program for African Agricultural Research (SPAAR), and the CGIAR deserve continued support. The CGIAR and SPAAR have demonstrated effectiveness in coordinating donor assistance and ESDAR, though much more recent, is producing results in promoting cooperation and more effective research investments. This collaborative relationship should broaden to include dialog with other multi-lateral development banks. However, to the extent possible, staff resources and program support should target specific NARS programs rather than the coordinating institutions. Co-financing or parallel financing by USAID and the banks could draw on the comparative advantages of both institutions to the benefit of country or regional programs.

USAID could usefully establish a limited Trust Fund or support fund for use in involving US universities and institutions in Bank operations in the NARSs. This should not be for "consulting contracts," but for "grant assistance" to US programs to permit collaboration with the NARSs on Bank project designs, evaluations, and technical reviews. This would serve to increase US institutional interactions with international agricultural programs and should be based on potential for longer term relationships. Such a Trust Fund would help to improve impact of Bank projects on NARS development and would facilitate coordinated USAID-Bank support to the NARSs. The fund could be managed by ESDAR and could begin with funding in the range of US \$2 million per year.

USAID Should Seek to Increase US Agricultural Scientist Involvement in the Global Agricultural Research Network

Trends in international involvement are difficult to document, but it appears that overall US agricultural scientist involvement in international agriculture may have declined. Although private sector involvement may be increasing and US participation in the CGIAR system may be stable, US university involvement with international programs is thought to be substantially reduced. This is important as the universities are training grounds for future scientists and leaders in international activities. Decreased involvement—if in fact this is the case—may be due to decreased funding for international projects, decreased need or opportunity for younger scientists' participation in such programs, and/or lowered interest by younger scientists in overseas work.

More institutionally pluralistic research systems and more commercially-oriented agriculture will probably present a wider range of future opportunities for international involvement of US scientists. In the meantime, in order to develop a new generation of US agricultural researchers with international interests and to promote development of sound science-based programs in the NARSs, USAID should establish a research linkage program to involve US scientists, especially those early in their careers, in international agricultural research.

USAID Should Address Financing Issues for International Agricultural Research Programs through Policy Dialog and Innovative Funding Mechanisms, Including Establishment of Endowments Where Appropriate

One of the critical problems confronting international agricultural research is the decline in and lack of stability in funding. USAID, in conjunction with other donors, especially the World Bank, should raise the issue of funding for agricultural research in the context of broader country dialogs on development policy reform. Developing countries must demonstrate their own commitment to funding tech-

nology generation and diffusion programs. As appropriate, and certainly for the IARC programs, USAID, in concert with other donors, should seek to increase or maintain funding levels.

USAID should expand the efforts currently underway in the Africa Bureau and direct increased attention to developing innovative funding mechanisms for agricultural research. Endowments and independent foundations can be effective in promoting technology development and transfer (Horkan and Jordan, 1996). Such institutions may have greater operating flexibility and can contribute to further evolution of pluralistic NARSs, which are replacing the monopoly NARIs. Endowments, whether permanent or declining balance endowments, provide benefits from increased stability in funding levels for research. PL-480 resources offer an opportunity to capture currency generations from sale of food commodities for research to improve agricultural productivity and long term food security. Title II and Title III programs may offer opportunities for endowments in specific countries or specific institutions, and Title I might provide opportunities for broader programs, whereby a portion of program funding might be repaid immediately in dollars into an endowment to support international agricultural research.

Endowments might also be of use to partially fund operations of IARCs or other broader programs, such as that in the Global Research on the Environment and Agricultural Nexus (GREAN) program proposal (Lele and Coffman, 1995).

USAID Should, at an Appropriate Time, Undertake a Formal Review of its Agricultural Technology Activities and their Contribution to the Development of a Global Agricultural Research Network

The last major review of USAID agricultural research activities was in 1983. With the many changes in the international agricultural research environment and in USAID programs, it is time for a full review of activities. The purpose of such review would be to identify priorities for USAID investments in the international

agricultural research network. The review by a "blue ribbon" panel would look at current programs and their role in the international network and would look at current and future needs. The panel recommendations would thus provide a framework for future programs and funding.

Such a research review might be done under the auspices of BIFAD, but, however it is done, it would have to include a fairly broad range of participation. Though it would be best to avoid a large and complex process, the panel should include NARS research scientists and administrators, representation from the IARCs, and representation from other donors—possible from the World Bank and perhaps another bilateral donor. From the US side, the panel should include USAID participants from both the field and Global Bureau, representation from US universities, and representation from private sector and NGO perspectives. Private sector-NGO perspectives on the panel should provide research user orientation and insights into needs for technology systems to serve market-responsive, private sector development. Coordinating a review of this sort would be a challenge, but it is necessary to ensure a rigorous and objective review and to consider various perspectives of needs for developing the global agricultural research network.

This review, or possibly, separate more limited reviews, might also look at the CGIAR and CRSP programs. In the case of the CGIAR system, there are some limitations in a review, in that there is obviously a range of stakeholders with USAID providing only a small portion of the funding. Many issues have also been addressed in the context of the CGIAR "renewal" initiated in 1995. The CGIAR System Review in 1997/98 will present another opportunity for a strategic look at the CG System and programs. However, an independent US perspective may give fresh ideas and input to the CGIAR System Review and future direction of the System. Major questions for a USAID review would include: whether the current system adequately covers global commodity and eco-regional needs; whether alternative operating procedures could reduce costs; whether alternative sources of funding are possible; and how better

links with NARSs can facilitate improved client orientation in research and faster dissemination of research findings. These questions should be addressed by the 1997/98 System Review, whether or not they are looked at separately by USAID.

A review of the CRSP programs would be valuable to confirm directions of the CRSPs, up-date the over-all strategy, and provide guidance for future programs. This review could start from the comprehensive 1995 evaluation of the CRSPs, but would look not at how the current CRSPs function, but at their role in terms of the needs of the broader global agricultural research network. Specific questions would include: what commodities or problems should be the basis of future CRSPs; how can CRSPs most effectively link with IARCs and NARSs; how much emphasis should be given to dissemination of research results and how this should be done; how can the CRSPs draw from a broader network of US participants and impact on a broader geographical area in developing countries; and what changes could reduce costs of the programs to permit expansion of coverage.

One consideration in this review is the fact that with reduced overall funding it may not be justifiable to have IARC and CRSP programs concentrating on the same commodity. The

CRSPs could effectively fill gaps in IARC programs, but in all cases of mutual interest, there should be close coordination to promote efficiencies.

In summary, the above recommendations would enable the Agency to continue critical support to agriculture and natural resource research programs in lines with current Agency strategies and sound development approaches. Funding constraints and concern for efficiency require approaches that maximize local participation and program direction and that rely on partnerships with other donors. Concerns with sustainability would dictate attention to financial sustainability and linkage of US scientists into a research global system. Increasingly, research programs must be market-oriented and demand-driven to be efficient and sustainable. These issues have all been incorporated to some extent into current programs. However, with the changes in USAID funding and staff capabilities and the changes in global agriculture and research capabilities that have occurred since USAID's Agricultural Sector Strategy was completed in 1984, it would now seem useful for a review or series of reviews to ensure that research programs are adequately and efficiently addressing global concerns with food security, environmental protection, and poverty alleviation.

Annexes

Annex 1. List of Identified USAID Projects with Agricultural Research Related Funding

<i>Country</i>	<i>Project title</i>	<i>Starting fiscal year</i>	<i>Ending fiscal year of obligation</i>	<i>Total commitment (\$million)</i>	<i>National, Regional, or International</i>	<i>Free standing, partial, or education</i>	<i>Estimated research funding (\$million)</i>
1 Afghanistan	Nat'l Agr Development	52	79	11.56	N	P	8.00
2 Afghanistan	Helm-Argh Valley Dev	54	77	20.20	N	P	8.00
3 Afghanistan	Agricultural Education	56	77	6.20	N	E	6.20
4 Afghanistan	Higher Ed-Kabul U	73	78	2.90	N	P	1.50
5 Afghanistan	Agricultural Inputs	75	77	8.00	N	P	0.80
6 Afghanistan	Integrated Wheat Dev	77	79	4.40	N	P	0.90
7 Bangladesh	Development Serv & Train	74	79	1.80	N	P	0.20
8 Bangladesh	Project Studies	74	79	0.90	N	P	0.10
9 Bangladesh	Agricultural Research	76	80	8.20	N	F	8.20
10 Bangladesh	Agr. Research Phase II	81	89	46.50	N	F	46.50
11 Burma	Maize & Oilseeds Prod	82	85	30.00	N	P	3.00
12 Burma	Agr Res. & Dev	85	91	11.30	N	F	11.30
13 Burma	Ag Production	86	91	30.00	N	P	1.50
14 India	Agr. University Dev.	63	77	9.90	N	E	9.90
15 India	Agricultural Production	66	77	2.00	N	P	1.00
16 India	Soil & Water Mgmt	66	75	0.50	N	P	0.30
17 India	Grain Utilization	68	74	0.20	N	F	0.20
18 India	Gujarat Medium Irrig	78	78	30.00	N	P	3.00
19 India	Appl of SciTech to Rural Dev	78	78	2.00	N	P	0.20
20 India	Madhya Pradesh Soc. Forestry	81	83	17.00	N	P	1.70

Annex 1 (continued)

	Country	Project title	Starting fiscal year	Ending fiscal year of obliga- tion	Total commit- ment (\$million)	National, Regional, or Inter- national	Free standing, partial, or educa- tion	Estimated research funding (\$million)
21	India	Maharashtra Soc. Forestry	82	88	20.40	N	P	2.00
22	India	Maharashtra Irr Tech&Mgmt	82	82	47.00	N	P	2.30
23	India	Agricultural Research	83	87	18.40	N	F	18.40
24	India	Irr Mgmt & Trning	83	91	49.70	N	P	5.00
25	India	Hill Area Land/Water Dev	84	87	23.60	N	P	2.40
26	India	Maharashtra Minor Irr	84	85	38.60	N	P	1.90
27	India	National Social Forestry Support	85	89	57.00	N	P	2.80
28	Indonesia	Higher Agr. Education	70	76	7.40	N	E	7.40
29	Indonesia	Agricultural Research	71	80	3.30	N	F	3.30
30	Indonesia	Agr Education For Dev.	76	76	5.50	N	E	5.50
31	Indonesia	Sumatra Agr. Research	77	78	9.00	N	F	9.00
32	Indonesia	Agr Dev Plan & Admin	77	78	6.80	N	P	2.60
33	Indonesia	Sederhana Irrigation II	78	81	36.30	N	P	1.80
34	Indonesia	Sci & Tech Res. Asst Trg	78	80	6.40	N	P	4.30
35	Indonesia	Graduate School of Agr.	79	80	7.50	N	E	7.50
36	Indonesia	Citanduy River Basin Dev	80	83	27.00	N	P	5.40
37	Indonesia	Applied Agr Research	80	93	28.30	N	F	28.30
38	Indonesia	Western Univ. Agr. Ed	81	87	24.40	N	E	24.40
39	Indonesia	Secondary Food Crop Dev	83	86	7.40	N	P	5.00
40	Indonesia	Upland Agr. & Conserv	84	93	34.70	N	P	6.90
41	Indonesia	Aquatic Resources Dev.	86	86	2.80	N	F	2.80
42	Indonesia	Agr & Rrl Sector Support	87	96	185.30	N	P	5.00
43	Indonesia	Agribusiness Dev	91	97	40.00	N	P	2.00
44	Korea	Rural Policy Plan/Survey	63	74	6.00	N	P	1.00
45	Korea	Agr. Research	74	79	5.00	N	F	5.00
46	Laos	Agr. Dev.-Crops/Soils	63	75	18.90	N	F	18.90
47	Nepal	Foodgrain Technology	57	78	4.30	N	F	4.30
48	Nepal	Inst. of Agr & Anim. Sci.	74	82	5.50	N	E	5.50
49	Nepal	Integrated Cereals	75	84	8.20	N	F	8.20
50	Nepal	Ag Dev Council	76	85	2.40	N	P	2.40
51	Nepal	Resource Conserv & Utiliz	80	87	27.50	N	P	2.70
52	Nepal	Institute of Ag & An Sci II	85	88	4.10	N	E	4.10
53	Nepal	Agr. Res. & Prod	85	89	10.00	N	P	9.00
54	Nepal	Forestry Initiative	86	90	2.40	N	P	1.20
55	Nepal	Agroenterpr & Tech Systems	90	95	12.00	N	P	9.00
56	Nepal	Sustain Income & Rrl Enterpise	93	96	12.00	N	P	1.50
57	Pakistan	W. Pakistan Agr Univ.	64	73	2.10	N	E	2.10
58	Pakistan	Agr. Technology Support	68	74	1.50	N	F	1.50
59	Pakistan	Agricultural Research	69	82	11.20	N	F	11.20
60	Pakistan	Special Development Act.	73	74	0.10	N	F	0.10
61	Pakistan	Dryland Agr. Development	75	79	0.70	N	P	0.10
62	Pakistan	Forestry Planning & Dev	83	91	35.00	N	P	3.50

Annex 1 (continued)

Country	Project title	Starting fiscal year	Ending fiscal year of obligation	Total commitment (\$million)	National, Regional, or International	Free standing, partial, or education	Estimated research funding (\$million)	
63	Pakistan	Northwest Frontier Dev	83	91	63.00	N	P	3.20
64	Pakistan	Transform/Integ Prov Ag	84	91	55.50	N	E	55.50
65	Pakistan	Mgmt of Ag Res & Tech	84	90	38.00	N	F	38.00
66	Philippines	Inland Fisheries	71	76	0.50	N	P	0.30
67	Philippines	Small Farmer Inc. & Prod.	75	79	1.00	N	P	0.20
68	Philippines	Aquaculture Production	75	79	0.90	N	P	0.50
69	Philippines	Cabusao Integ. Area Dev.	75	75	3.50	N	P	0.30
70	Philippines	Agr. Research	76	76	5.00	N	F	5.00
71	Philippines	Pest Control	78	78	5.00	N	P	1.00
72	Philippines	Bicol IRD	78	78	2.20	N	P	0.20
73	Philippines	Agr. Research II	79	81	10.00	N	F	10.00
74	Philippines	Agr. Education Outreach	79	82	2.50	N	E	2.50
75	Philippines	Farming System Dev	81	87	5.60	N	F	5.60
76	Philippines	Rainfed Resources Dev.	82	92	24.30	N	P	8.10
77	Philippines	Accelerated Ag Production	86	90	30.00	N	P	1.50
78	South Pacific	S. P. Region Ag Dev.	80	91	13.00	N	E	13.00
79	Sri Lanka	Rice Research	77	77	3.30	N	F	3.30
80	Sri Lanka	On-Farm Water Mgmt	77	78	5.10	N	P	1.00
81	Sri Lanka	Agr. Education Dev.	78	82	7.50	N	E	7.50
82	Sri Lanka	Water Management	79	84	12.20	N	P	1.20
83	Sri Lanka	Reforest & Watershed Mgmt	80	83	10.40	N	P	3.10
84	Sri Lanka	Diversi. Ag. Research	84	90	14.60	N	P	12.00
85	Sri Lanka	Irr. Systems Mgmt.	86	91	18.60	N	P	2.40
86	Sri Lanka	Mahaweli Ag & RD	87	95	23.00	N	P	6.50
87	Sri Lanka	Agroenterprise	92	97	14.00	N	P	2.00
88	Thailand	Agricultural Research	64	79	10.50	N	P	7.00
89	Thailand	Highland Agr. Res. Station	74	74	0.00	N	F	0.00
90	Thailand	Lam Nam Oon On-Farm Dev	77	77	4.60	N	P	0.50
91	Thailand	Land Settlements	79	80	4.20	N	P	0.40
92	Thailand	Highland Area Dev.	80	87	9.20	N	P	4.60
93	Thailand	Khon Faen Univ. Res. Ddev	83	86	2.20	N	E	2.20
94	Vietnam	Crop Production	67	77	31.70	N	P	23.90
95	Asia	Mekhong Basin Dev.	59	78	6.20	R	P	0.60
96	Asia	Regional Ed.—SEARCA	67	85	20.90	R	E	10.40
97	Asia	IRRI	68	75	1.80	R	F	1.80
98	Asia	SE-Asia-Fisheries	69	73	0.30	R	F	0.30
99	Asia	Asia Found Support	69	79	41.30	R	P	2.00
100	Asia	AVRDC	71	76	3.00	R	F	3.00
101	Asia	ASEAN Human Resources	87	92	14.60	R	P	1.40
102	Botswana	Bots. Crop Prod.	76	79	1.70	N	P	0.20
103	Botswana	IVS Bots. Hort. Dev	78	83	0.70	N	P	0.10
104	Botswana	Rural Dev.	80	84	9.80	N	P	1.00
105	Botswana	Ag Technol. Impr.	81	86	9.20	N	P	2.30
106	Burkina faso	Upper Volta Seed Multipli	75	75	1.70	N	P	0.20

Annex 1 (continued)

	Country	Project title	Starting fiscal year	Ending fiscal year of obligation	Total commitment (\$million)	National, Regional, or International	Free standing, partial, or education	Estimated research funding (\$million)
107	Burkina Faso	Eastern Reg. Food Prod.	81	82	3.00	N	P	0.30
108	Burkina Faso	Agr Res & Trng Support	88	94	7.40	N	F	7.40
109	Burundi	Basic Food Crops	80	85	6.70	N	P	2.20
110	Burundi	Small Farming Systems Res.	83	93	11.80	N	F	11.80
111	Burundi	Burundi Enterpr. Sup&Trg	90	97	7.40	N	P	0.00
112	Cameroon	National Cereals Res.	79	84	7.70	N	F	7.70
113	Cameroon	Small Farm Livstock Dev	80	83	1.30	N	P	0.20
114	Cameroon	Nat'l Cereals Res & Ext	85	94	39.00	N	P	19.50
115	Cameroon	Tropical Root/Tuber Res.	86	94	9.20	N	F	9.20
116	Cameroon	Ag Education II	91	95	15.00	N	E	15.00
117	Cameroon	Root & Tuber Crop Res.	92	94	0.00	N	F	0.00
118	Cape Verde	Tarrafal Water Resources	77	80	5.20	N	P	1.00
119	Cape Verde	Food Crop Res.	82	92	4.70	N	F	4.70
120	Cape Verde	Watershed & Appld Res. Dev.	90	92	3.80	N	P	2.70
121	Ken. Afr. Rep.	Seed Production Ctr	75	78	0.50	N	P	0.10
122	Chad	Lake Chad Irr. Ag	77	77	1.30	N	P	0.20
123	Chad	Range & Lvstk Dev.	77	79	3.20	N	P	0.80
124	Chad	Ag Instit. Dev—Res.	78	79	0.40	N	F	0.40
125	Chad	Crop Prod, Res, Seed, Gr	78	79	0.20	N	P	0.10
126	Ethiopia	Agr Sector Loan	70	75	20.00	N	P	2.00
127	Ethiopia	Pulse Diversif & Improve	74	79	1.40	N	P	0.70
128	Gambia	Mixed Farm & Resource Mgmt	79	84	8.80	N	P	4.40
129	Gambia	Ag. Res. & Diversif	85	91	18.00	N	P	13.50
130	Ghana	Faculty of Agr	66	76	0.80	N	E	0.80
131	Ghana	Managed Input & Agri Serv	76	79	15.20	N	P	1.50
132	Guinea	Guinea Ag Prod & Trng	76	82	14.40	N	E	14.40
133	Guinea	Smallholder Prod. Prep.	83	88	3.60	N	P	1.80
134	Guinea	Natural Resources Mgmt	90	95	11.80	N	P	1.20
135	Guinea	Agr. Marketing Investment	91	97	5.80	N	P	0.50
136	Guinea-Bissau	Forestry-Zone I	77	82	0.10	N	P	0.10
137	Guinea-Bissau	Rice Prod II	80	86	4.60	N	P	1.10
138	Guinea-Bissau	Food Crop Protection III	85	88	2.20	N	P	1.10
139	Ivory Coast	Social Science Res.	78	78	0.30	N	F	0.30
140	Kenya	Agr. Systems Support	78	83	49.80	N	P	5.00
141	Kenya	Drylands Cropping Syst. res.	79	86	4.10	N	F	4.10
142	Kenya	ICIPE	79	86	10.20	N	F	10.20
143	Kenya	On-Farm Grain Storage	81	87	7.80	N	P	0.80
144	Kenya	National Ag. Research	86	96	38.70	N	F	38.70
145	Kenya	Instit. Dev. for Ag Trg.	86	94	7.20	N	E	7.20
146	Kenya	Cntr for Excel for Ag Dev	92	96	0.00	N	E	0.00
147	Lesotho	Thaba Bosia Rural Dev.	73	79	3.20	N	P	0.30
148	Lesotho	Farming Systems Res.	78	85	11.20	N	F	11.20

Annex 1 (continued)

<i>Country</i>	<i>Project title</i>	<i>Starting fiscal year</i>	<i>Ending fiscal year of obligation</i>	<i>Total commitment (\$million)</i>	<i>National, Regional, or International</i>	<i>Free standing, partial, or education</i>	<i>Estimated research funding (\$million)</i>	
149	Lesotho	Agr. Planning	80	87	6.20	N	P	0.60
150	Liberia	Upper Bong Co. IRD	77	77	6.60	N	P	0.70
151	Liberia	Agr. Res. & Ext.	80	82	4.50	N	P	3.00
152	Liberia	Ag Res. & Ext II	84	89	9.90	N	P	8.00
153	Madagascar	IRRI Rice Res.	90	90	5.60	N	F	5.60
154	Malawi	Agr. Res.	79	82	9.00	N	F	9.00
155	Malawi	Ag. Res. & Ext.	85	89	15.00	N	P	7.50
156	Malawi	Ag Sector Asst. Support	91	96	15.00	N	P	1.50
157	Malawi	Ag Sector Asst Progr.	91	96	20.00	N	P	0.50
158	Mali	Mali Livestock Dev	74	79	4.50	N	P	1.10
159	Mali	Tsetse Fly Mali	76	77	1.00	N	P	0.80
160	Mali	Operation Mils-Mopti II	76	81	14.40	N	P	1.40
161	Mali	Crop Prod-Action Riz-Sorgho	76	82	4.20	N	P	0.40
162	Mali	Action Ble	78	81	2.10	N	P	0.20
163	Mali	Semi-Arid Tropics Res.	79	81	0.60	N	F	0.60
164	Mali	Mali-San Pilot Fish Prod	79	81	0.30	N	P	0.20
165	Mali	Village Reforest in Mali	80	82	1.00	N	P	0.30
166	Mali	SemiAr Trop Crop Res II	81	87	7.80	N	F	7.80
167	Mali	Livestock Sector II	82	91	23.70	N	P	4.70
168	Mali	Farming Syst R & E	85	94	20.80	N	P	14.80
169	Mali	Sahel Human Res. Dev III	86	87	19.00	N	E	0.20
170	Mali	Progr. & Dev Support Fund	88	96	1.00	N	P	0.10
171	Mali	Streg. Res. Plan & Res on Comm	90	97	19.50	N	F	19.50
172	Mali	Cereals Mrkt Restruct.	85	88	1.00	N	P	0.10
173	Mauritania	M. Rural Dev.	77	82	6.60	N	P	3.30
174	Mauritania	Vegetable Prod.	78	82	1.80	N	P	0.90
175	Mauritania	Integr. Dev. of Oases	80	82	6.00	N	P	1.50
176	Mauritania	Mauritania Ag. Res.	84	89	4.20	N	F	4.20
177	Mauritania	Dirol Plain Operat. Res.	85	85	0.50	N	P	0.30
178	Mozambique	Private Sector Support TA	90	95	13.50	N	P	2.00
179	Niger	Rural Integrated Ag Dev	78	79	0.50	N	F	0.50
180	Niger	Extension Support Center	82	87	10.00	N	P	1.00
181	Niger	Herder Organization Dev.	83	89	5.00	N	P	1.00
182	Niger	Applied Ag. Research	87	97	20.00	N	F	20.00
183	Niger	Ag. Sector Dev Grant II TA	90	95	5.00	N	P	1.00
184	Niger	Ag Res. Inter CRSP	93	96	0.00	N	F	0.00
185	Nigeria	Faculty of Agr-IFE	65	77	6.00	N	E	6.00
186	Nigeria	Agr & Vet Med-ABU	65	77	7.10	N	E	7.10
187	Nigeria	Rubber Dev.	65	74	0.90	N	P	0.50
188	Nigeria	Ag Dev Studies & Eval	65	73	1.70	N	P	0.20
189	Nigeria	Maize & Rice Prod.	71	79	2.10	N	P	0.50
190	Nigeria	Ahmadu Univ Of Vet Med	71	79	4.50	N	E	4.50
191	Rwanda	Local Crop Storage	79	80	2.60	N	P	0.30
192	Rwanda	Fish Culture	81	82	2.40	N	P	0.60

Annex 1 (continued)

Country	Project title	Starting fiscal year	Ending fiscal year of obligation	Total commitment (\$million)	National, Regional, or International	Free standing, partial, or education	Estimated research funding (\$million)	
193	Rwanda	Farming Systems Res.	84	91	15.70	N	P	12.00
194	Rwanda	Natural Res. Mgmt	89	94	12.20	N	P	6.20
195	Rwanda	Adaptive Food &aG Res	92	99	0.00	N	F	0.00
196	Senegal	Senegal Cereal	75	79	4.70	N	P	2.40
197	Senegal	Bakel Crop Prod.	77	84	7.80	N	P	0.70
198	Senegal	Casamance Reg. Dev.	78	84	21.40	N	P	1.10
199	Senegal	Cereals Prod	80	83	7.70	N	P	2.70
200	Senegal	Ag. Res. & Planning	81	85	5.40	N	F	5.40
201	Senegal	Sen. Ag. Res.	84	90	5.10	N	F	5.10
202	Senegal	Sahel Human Res. Dev III	86	87	19.00	N	E	0.20
203	Senegal	Ag. Dev. Support	87	89	20.00	N	P	2.00
204	Senegal	So. Zone Water Mgmt	88	95	18.50	N	P	6.10
205	Senegal	Nat. Res. Based Ag Res	89	97	19.80	N	F	19.80
206	Senegal	Commun-Basd NRM	93	99	7.00	N	P	2.00
207	Seychelles	Food Crops Res.	79	81	1.50	N	F	1.50
208	Sierra Leone	Adapt Crop Res. & Ext	69	78	1.00	N	P	0.50
209	Sierra Leone	Adapt. Crop Res. & Ext	78	86	8.00	N	P	4.00
210	Somalia	Agricultural Services	62	75	5.60	N	P	1.40
211	Somalia	Agr. Ext Train & Res.	78	79	4.00	N	P	2.00
212	Somalia	Central Rangeland dev.	79	89	14.90	N	P	3.00
213	Somalia	Agr. Delivery Serv	79	83	8.60	N	P	0.40
214	Somalia	Bay Region Ag. Dev.	80	83	11.20	N	P	0.50
215	Somalia	Shebelli Water Mgmt I	87	90	6.90	N	P	0.70
216	Sudan	Southern Region Ag Rehab	76	78	0.20	N	P	0.10
217	Sudan	Blue Nile Ag. Dev.	78	83	12.00	N	P	3.00
218	Sudan	Western Sudan Ag Res.	78	82	26.00	N	P	26.00
219	Sudan	Yambio Ag Res. Station OPG	79	80	1.10	N	F	1.10
220	Sudan	Reforestation & Anti-Deserti	87	90	8.00	N	P	0.80
221	Swaziland	Cropping Sys Res & Ext Trng	81	89	11.60	N	P	7.80
222	Tanzania	Agr Research	71	81	8.50	N	F	8.50
223	Tanzania	Livestock Market Dev	73	78	2.60	N	P	0.30
224	Tanzania	Farming Systems Res.	82	82	3.00	N	F	3.00
225	Tanzania	University Linkage	90	92	2.40	N	E	2.40
226	Togo	Togo Animal Traction	83	88	5.20	N	P	0.50
227	Tunisia	Agricultural Research	82	82	2.80	N	F	2.80
228	Uganda	Graduate Agr. Faculty	71	76	1.10	N	E	1.10
229	Uganda	Manpower for Ag Dev.	83	92	24.90	N	E	16.60
230	Uganda	Oil Seed Prod.	85	92	5.80	N	P	3.00
231	Uganda	Marketing & Ag Res. Strength	94	99	45.10	N	P	22.60
232	Zaire	North Shaba Maize Prod	76	85	18.60	N	P	2.80
233	Zaire	Inera Support	77	81	3.80	N	F	3.80
234	Zaire	Manioc Outreach	78	82	4.40	N	P	0.80
235	Zaire	Appld. Ag Res. & Ext	83	88	15.00	N	P	12.80

Annex 1 (continued)

	Country	Project title	Starting fiscal year	Ending fiscal year of obligation	Total commitment (\$million)	National, Regional, or International	Free standing, partial, or education	Estimated research funding (\$million)
236	Zaire	Area Food&Mrkt Develop	85	90	15.00	N	P	1.50
237	Zaire	Applied Ag Res. II	89	91	25.00	N	F	25.00
238	Zambia	Agr. Dev- Res. & Ext.	80	84	12.50	N	P	8.20
239	Zambia	Commodity Import Progr.	84	84	15.00	N	P	1.50
240	Zimbabwe	Ag Sector Assistance	82	89	62.00	N	P	6.20
241	Zimbabwe	Grain Mrktg Reform Res.	91	96	0.40	N	F	0.40
242	Africa	Major Cereal/Legume Imp	64	73	0.20	R	F	0.20
243	Africa	Reg. Wheat Improvement	67	79	0.70	R	P	0.40
244	Africa	Rice Prod & Marketing	69	77	0.80	R	P	0.10
245	Africa	Soil & Crop Mgmt	70	75	3.80	R	P	2.60
246	Africa	Agr Research Survey	70	74	0.20	R	F	0.20
247	Africa	Afr-Amer. Scholars	70	70	1.50	R	P	0.20
248	Africa	Rice Res & Prod	75	80	6.70	R	P	4.60
249	Africa	Entente Food Prod	76	84	17.80	R	P	2.00
250	Africa	Entente Livestock II	76	84	7.80	R	P	2.00
251	Africa	SAFGAD	77	86	0.50	R	F	0.50
252	Africa	West Afr. Rice Developm.	81	86	12.00	R	P	9.00
253	Africa	Strengthening Afr. Ag Res.	82	93	48.80	R	F	48.80
254	Africa	Streng. Mgmt of Ag Res.	82	82	0.50	R	F	0.50
255	Africa	SemiAr Food Grn Res Dev II	86	93	12.30	R	F	12.30
256	Africa	Rural Soc. Sci Res. Capac	90	90	0.30	R	F	0.30
257	Africa	Pol, Anal, Res, & TA	91	98	46.10	R	P	33.50
258	Africa	Appld Dev Res. in Sahel	92	98	9.90	R	F	9.90
259	East Africa	Animal & Crop Prod-EA	69	74	0.30	R	P	0.10
260	East Africa	Major Cereal & Leg Impr	70	74	1.10	R	F	1.10
261	East Africa	EA Comm Freshwater Fish	71	76	2.20	R	P	1.10
262	East Africa	EAF Comm Food Crop Res	72	80	3.00	R	F	3.00
263	Sahel	Reg Cntr Agr. Sci	69	76	1.90	R	F	1.90
264	Sahel	Major Cereals-Sahel	70	78	3.50	R	F	3.50
265	Sahel	OMVS Agron. Res.	70	75	1.30	R	F	1.30
266	Sahel	Federal Adv School of Ag	74	79	1.60	R	E	1.60
267	Sahel	OMVS Agron. Res.	76	79	0.90	R	F	0.90
268	Sahel	Regional Food Crop Prot.	78	85	32.30	R	P	16.10
269	Sahel	Project Dev & Design	78	88	0.30	R	P	0.30
270	Sahel	OMVS Ag Res.	84	84	1.10	R	F	1.10
271	Sahel	Strength. Afr. Ag. Res.	84	84	0.50	R	F	0.50
272	So.Africa	Reg. Technician Training	70	73	0.10	R	P	0.10
273	So.Africa	Reg. Sorghum/Millet Res.	83	96	40.10	R	F	40.10
274	So.Africa	Reg. Agr. Res. Coordinat	84	92	5.10	R	F	5.10
275	So.Africa	S.A. Ag Res. Mgt Trng II	92	92	1.50	R	F	1.50
276	So.Africa	S. Afr. Root Crop Res. Net.	93	95	7.00	R	F	7.00
277	Portugal	Tech Consultants & Train	75	89	12.90	N	E	1.20
278	Portugal	Agricultural Production	80	80	10.60	N	P	3.50
279	Argentina	F & C Elev. Grain Storag	63	75	8.60	N	P	0.80
280	Argentina	Animal Dis & Meat Lab	66	76	1.40	N	P	0.40

Annex 1 (continued)

	Country	Project title	Starting fiscal year	Ending fiscal year of obliga- tion	Total commit- ment (\$million)	National, Regional, or Inter- national	Free standing, partial, or educa- tion	Estimated research funding (\$million)
281	Belize	Comm. of Alternate Crops	85	91	8.10	N	P	2.70
282	Bolivia	Prod & Mark of Ag Prod	71	81	27.20	N	P	9.00
283	Bolivia	Agr. Dev. Sector I	75	77	9.20	N	P	1.80
284	Bolivia	Basic Food Prod & Mark	75	82	6.90	N	P	1.70
285	Bolivia	Exploratory Res. on Plan Sys	77	79	0.50	N	F	0.50
286	Bolivia	Farm Policy Study	78	80	1.10	N	P	0.20
287	Bolivia	Chapare Reg. Dev.	83	90	38.50	N	P	3.80
288	Bolivia	Cochabamba RDP	91	97	98.00	N	P	5.00
289	Bolivia	Sustainable Forestry Mgmt	93	99	15.00	N	P	10.00
290	Brazil	Agricultural Ed.	63	78	20.20	N	E	20.20
291	Brazil	Agr. Res. & Ext. Dev	63	75	8.90	N	P	4.40
292	Brazil	Dev Hi Qual Prot Corn	63	75	8.90	N	F	8.90
293	Brazil	Fish Prod.	64	76	3.20	N	P	1.60
294	Brazil	Dev. Sci. & Tech Resear	65	74	0.20	N	P	0.10
295	Brazil	Agricultural Research	70	70	10.20	N	F	10.20
296	Caribbean	Farming Systems R&D	83	88	7.60	R	F	7.60
297	Colombia	Nat'l Soil Fertility	70	70	0.10	N	F	0.10
298	Colombia	Agr Regional Sector Loan	71	75	26.50	N	P	2.60
299	Colombia	Fisheries Research	75	80	2.20	N	F	2.20
300	Colombia	Small Farm Development	76	79	3.40	N	P	1.10
301	Costa Rica	Commodity Systems	77	77	5.50	N	P	1.10
302	Costa Rica	Natural Resource Cons	79	80	8.00	N	P	1.60
303	Dominican Rep	Agr Sector Loan II	62	74	2.10	N	P	0.50
304	Dominican Rep	Agr Sector Loan II	76	77	15.00	N	P	1.50
305	Dominican Rep	Agr Sector Loan II	79	79	0.20	N	P	0.20
306	Dominican Rep	Natura; Resource Plan & Dev	81	84	8.60	N	P	0.90
307	Dominican Rep	Inland Fisheries	82	84	0.30	N	P	0.10
308	Dominican Rep	Agr. Sector Training	83	83	5.00	N	E	5.00
309	Dominican Rep	Commercial Farm. Systems	87	89	14.80	N	P	3.70
310	Dominican Rep	Commercial Agribus. Partn.T	89	96	24.00	N	E	24.00
311	Ecuador	Rural Technology Transfer	80	87	9.80	N	P	2.00
312	Ecuador	Forestry Sector Dev.	82	91	7.80	N	P	1.60
313	Ecuador	Ag. Res. Ext. & Ed	87	94	7.00	N	P	3.50
314	El Salvador	Agr. Development	70	70	5.50	N	P	1.40
315	El Salvador	Agr Develop Res, Ed, & Ext	72	78	3.70	N	P	3.00
316	El Salvador	Agrarian Reform Sector Sup.	83	87	46.00	N	P	9.20
317	El Salvador	Coffee Tech Transfer	91	95	24.00	N	P	4.80
318	Guatemala	Food Prod & Nutr Improve	75	79	1.70	N	P	1.20
319	Guatemala	Small Farm Diversif. System	81	85	8.00	N	P	2.00
320	Guatemala	Highlands Agr. Dev.	83	93	37.60	N	P	3.80
321	Guyana	Diversif & Dev of Agr.	67	76	2.00	N	P	1.00
322	Guyana	Rice Modernization	69	78	12.90	N	P	3.20

Annex 1 (continued)

	Country	Project title	Starting fiscal year	Ending fiscal year of obligation	Total commitment (\$million)	National, Regional, or International	Free standing, partial, or education	Estimated research funding (\$million)
323	Guyana	Small Farm Dev-Black Bush	78	82	8.90	N	P	0.90
324	Guyana	Agr. Sector Reform	93	94	0.60	N	P	0.10
325	Haiti	Integrate Agr. Dev.	76	85	11.60	N	P	2.30
326	Haiti	Agr. Dev Support II	78	90	3.80	N	P	3.00
327	Haiti	Agro-Forestry Outreach	81	89	27.00	N	P	6.30
328	Haiti	Agric. Station Feasibility St.	83	83	0.40	N	P	0.40
329	Haiti	Targeted Watershed Mgmt	86	96	31.40	N	P	3.10
330	Haiti	Local Resources Dev. II	86	89	1.00	N	P	0.10
331	Haiti	Coffee Sector Assistance	86	88	2.00	N	P	1.00
332	Haiti	Coffee Revitalization	90	95	10.30	N	P	2.60
333	Haiti	Productive Land Use Syst.	90	95	55.10	N	P	5.50
334	Honduras	Feasibility Study	66	75	0.40	N	P	0.10
335	Honduras	Core Services	73	77	1.60	N	P	0.20
336	Honduras	Agricultural Research	78	83	2.60	N	F	2.60
337	Honduras	Agricultural Research Foundation	84	91	20.00	N	F	20.00
338	Honduras	Pan American Ag School	89	89	0.80	N	F	0.80
339	Jamaica	Fish Prod System Dev.	79	82	3.20	N	P	0.80
340	Jamaica	Hillside Assessment	85	85	0.60	N	P	0.30
341	Jamaica	Jamaica Ag. research	86	96	7.60	N	F	7.60
342	Jamaica	Hillside Agriculture	87	97	20.00	N	P	2.00
343	Nicaragua	Irrigation Dev	70	74	0.10	N	P	0.10
344	Nicaragua	Agr. Prod. & Diversific.	70	76	0.90	N	P	0.20
345	Nicaragua	Land Reform	80	82	1.40	N	P	0.10
346	Nicaragua	Approp. Ag. Technology	81	82	0.10	N	F	0.10
347	Panama	Agr. Technology Dev.	79	88	11.70	N	P	5.80
348	Panama	Managed Fish Prod.	80	84	1.10	N	P	0.30
349	Paraguay	Institutional Dev.	69	78	4.80	N	P	0.50
350	Paraguay	Small Farmer Livestock	70	70	0.30	N	P	0.10
351	Paraguay	Farm Mgmt Service-SF	70	70	0.40	N	P	0.10
352	Paraguay	Small Farm Technology	79	81	6.00	N	P	1.50
353	Paraguay	Minifundia Crop Intensif.	79	81	2.00	N	P	0.50
354	Peru	Agr. Instit. Dev. & Opera	62	62	17.10	N	P	5.70
355	Peru	Soy & Corn Prod on Sm. F.	76	80	2.30	N	P	1.60
356	Peru	Use of Treated sewage	77	80	0.20	N	P	0.20
357	Peru	On Farm Water Mgmt.	78	80	0.50	N	P	0.20
358	Peru	Agr. Res., Exten, & Ed	80	87	19.60	N	P	13.50
359	Peru	Upper Huallaga Ag. Dev.	81	93	31.20	N	P	3.10
360	Peru	Agr. Technology transformation	87	93	47.30	N	P	23.60
361	Peru	Central Selva Res. Mgmt II	88	88	3.90	N	P	0.80
362	Salvador	Agribusiness Dev	87	94	58.50	N	P	2.00
363	Uruguay	Agr. Prod & Marketing	65	79	2.70	N	P	0.30
364	Uruguay	Agr Research & TA	75	77	4.80	N	P	3.20
365	Caribbean	Bahama Livestk R & D	70	70	9.80	N	P	6.00

Annex 1 (continued)

	<i>Country</i>	<i>Project title</i>	<i>Starting fiscal year</i>	<i>Ending fiscal year of obliga- tion</i>	<i>Total commit- ment (\$million)</i>	<i>National, Regional, or Inter- national</i>	<i>Free standing, partial, or educa- tion</i>	<i>Estimated research funding (\$million)</i>
366	Caribbean	Carib Region IRD	75	76	8.50	R	E	0.80
367	Caribbean	Food Crop Prod.	76	79	10.70	R	P	5.30
368	Caribbean	Small Farm Multiple Crop	78	81	2.20	R	F	2.20
369	Caribbean	Car. Dev. Facility III	81	81	16.00	R	P	1.60
370	Caribbean	Ag. Ext. II	82	88	11.00	R	P	1.10
371	Caribbean	St. Vincent Ag Dev.	84	84	2.00	N	P	0.20
372	Caribbean	Ag Research & Ext.	89	94	5.00	R	P	3.00
373	Caribbean	Car. Basin Growers' Ass.	92	94	0.00	R	P	0.00
374	LAC	Castelar Agri Grad School	71	77	1.20	R	E	1.20
375	LAC	Int'l Trop Ag Center	71	74	2.30	R	F	2.30
376	LAC	Ag Sector Support	73	74	0.30	R	P	0.10
377	LAC	Sector Analysis Support	73	77	4.50	R	P	0.10
378	LAC	Agr. Dev in Latin America	76	76	0.20	R	P	0.10
379	LAC	Soil Fertility	86	87	2.00	R	F	2.00
380	ROCAP	Agr. Res. Coord.-ROCAP	70	70	0.90	R	F	0.90
381	ROCAP	Soil Fertility Research	70	70	0.70	R	F	0.70
382	ROCAP	Small Farm Crop. Systems	70	70	1.60	R	F	1.60
383	ROCAP	Agri Info Systems	75	81	3.30	R	P	1.10
384	ROCAP	Small Farm Prod Systems	79	85	8.20	R	P	6.10
385	ROCAP	Reg. Coffee Pest Cont.	81	90	6.00	R	P	3.00
386	ROCAP	Ag. Secretariat	81	83	0.80	R	P	0.10
387	ROCAP	Integrated Pest Mgmt	84	89	6.80	R	P	5.50
388	ROCAP	Tree Crop Prod	85	92	9.00	R	P	4.50
389	ROCAP	Reg. Ag. Technology Network	87	90	2.50	R	P	1.50
390	ROCAP	Exp Ind Tech Supp	91	95	17.00	R	P	1.70
391	ROCAP	Sci for Env Prot & Ag Grwth	92	94	0.00	R	F	0.00
392	Egypt	Research & Research Mgmt	77	80	24.40	N	P	2.40
393	Egypt	Rice Research	77	81	21.80	N	P	10.90
394	Egypt	Agr. Development Systems	77	83	14.90	N	P	10.00
395	Egypt	Tech & Feasibility Studies	78	81	31.00	N	P	0.50
396	Egypt	Aquaculture Development	78	80	27.50	N	P	2.70
397	Egypt	Agr. Mechanization	79	80	40.00	N	P	2.00
398	Egypt	Major Cereals	79	85	52.40	N	P	26.20
399	Egypt	Data Collection & Analysis	80	80	5.00	N	P	0.50
400	Egypt	National Agr. Research	85	95	205.00	N	F	205.00
401	Egypt	Sci. & Tech for Developm	86	95	118.70	N	P	4.00
402	Egypt	University Linkages II	91	95	7.00	N	P	1.50
403	Jordan	Wheat Research & Prod.	67	77	0.60	N	P	0.30
404	Jordan	Vegetable Res & Prod	70	74	0.10	N	P	0.10
405	Jordan	Faculty of Agr	75	75	2.30	N	E	2.30
406	Jordan	Water Mgmt. Technology	77	79	1.30	N	P	0.30
407	Jordan	Jordan Valley Agr. services	81	87	6.40	N	P	4.20
408	Jordan	National Agr. Development	85	93	25.50	N	P	2.50
409	Morocco	Higher Agr. education	69	77	1.60	N	E	1.60

Annex 1 (continued)

Country	Project title	Starting fiscal year	Ending fiscal year of obligation	Total commitment (\$million)	National, Regional, or International	Free standing, partial, or education	Estimated research funding (\$million)	
410	Morocco	Agr Research & Train	75	78	0.30	N	F	0.30
411	Morocco	Dryland Farming	76	76	0.20	N	P	0.10
412	Morocco	Dryland Applied Ag Res.	78	94	50.00	N	E	50.00
413	Morocco	Range Mgmt Improvement	80	85	5.00	N	P	1.20
414	Morocco	Agronomic Institute	80	91	57.00	N	E	57.00
415	Morocco	Tadla Res. Mgmt	92	97	1.00	N	P	0.50
416	Oman	Fisheries Dev & Managmt	90	90	20.00	N	P	1.00
417	Syria	Ag Education-Livestock Prod	79	79	6.00	N	E	6.00
418	Tunisia	Agr. Prod & Research	70	77	1.60	N	P	1.10
419	Tunisia	Sci & Tech Project	78	79	2.00	N	P	0.20
420	Tunisia	Agr. Techno. Transfer	78	87	8.70	N	P	8.70
421	Tunisia	Inat Faculty Dev.	78	78	0.40	N	E	0.40
422	Tunisia	Small Holder Irrig.	79	85	0.50	N	P	0.50
423	Tunisia	CTRD Rural Ext & Outreach	79	85	21.40	N	P	1.70
424	Turkey	Cereals Production	68	77	1.60	N	P	0.80
425	Turkey	Agr. Dev. & Control	68	74	2.70	N	P	0.70
426	Yemen	Sorghum Production	73	78	0.30	N	F	0.30
427	Yemen	Poultry Development	75	79	1.90	N	P	1.00
428	Yemen	Tropical Fruit Improvement	76	80	1.90	N	F	1.90
429	Yemen	Sorghum & Millet Improve	76	80	3.30	N	F	3.30
430	Yemen	Faculty of Agr.	79	90	106.70	N	E	5.00
431	Yemen	Farming Pract. for Produc	89	90	40.00	N	P	4.00
432	Near East	Arid Lands Research Prpg	82	85	5.00	R	F	5.00
433	Near East	Regional Cooperation	86	95	10.00	R	P	5.00
434	International	Plant & Seed Materials	55	83	2.90	I	F	2.90
435	International	Seed Pro & Ind Dev	58	84	4.10	I	P	0.40
436	International	ContFert. TA	65	90	4.40	I	P	0.40
437	International	Sorghum Protein	66	79	3.20	I	F	3.20
438	International	Weed Control	66	82	4.40	I	F	4.40
439	International	Wheat-Impr. Nutr Quality	66	79	3.60	I	F	3.60
440	International	Control Vertebrate Pests	67	82	7.30	I	P	3.60
441	International	Impr. Postharvest Gr Sys	67	84	10.40	I	P	2.00
442	International	Breeding Agon Crops	68	74	0.20	I	F	0.20
443	International	Control Disease of Crop	68	74	0.20	I	F	0.20
444	International	Soil Fert/Plant Water Rel	68	75	0.20	I	F	0.20
445	International	Comp. Crop & Seed	68	75	0.20	I	F	0.20
446	International	Tailor Fert for Rice	68	73	0.50	I	F	0.50
447	International	ContPlant/Seed Materia	68	77	0.80	I	P	0.60
448	International	Soil fert in Humid Tropic	69	79	2.00	I	F	2.00
449	International	Analysis of Capital Prom.	69	75	1.40	I	P	0.10
450	International	Agron-Econ Res-Trop So	69	81	4.00	I	F	4.00
451	International	Fisheries Training Ctr	70	70	0.30	I	P	0.10
452	International	Aquaculture	70	79	1.60	I	P	0.40
453	International	Agr. & Econ Dev.	70	78	0.90	I	P	0.50

Annex 1 (continued)

	Country	Project title	Starting fiscal year	Ending fiscal year of obligation	Total commitment (\$million)	National, Regional, or international	Free standing, partial, or education	Estimated research funding (\$million)
454	International	Agr. & Econ Dev.	70	76	0.70	I	P	0.20
455	International	Agr. & Econ Dev.	70	70	0.90	I	P	0.40
456	International	Agr. & Econ Dev.	70	77	0.30	I	P	0.20
457	International	Tropical Soils	70	70	0.80	I	P	0.10
458	International	Un- & Under Employment	70	70	0.70	I	P	0.10
459	International	Prog. for Econ Analysis	70	83	7.20	I	P	0.50
460	International	Coconut Protein Product	70	78	0.60	I	F	0.60
461	International	Maize Protein Quality	70	79	1.80	I	F	1.80
462	International	Artif. Prop -Milkfish	70	70	1.30	I	F	1.30
463	International	Secondary Wood Util	70	70	0.60	I	P	0.30
464	International	Postharvest Food Loss	70	70	0.20	I	P	0.10
465	International	Soil Fert Utilization	70	72	0.30	I	F	0.30
466	International	Pest Mgmt & Environ Prot.	71	84	7.60	I	P	1.50
467	International	Rural Dev	72	72	0.80	I	P	0.10
468	International	Disease & Insect Cont	73	80	0.80	I	P	0.60
469	International	Improve of Soybeans for Tr	73	79	0.50	I	F	0.50
470	International	CONTDev Impr Sybean	73	84	7.90	I	F	7.90
471	International	Improved Fert for LDC's	73	75	0.40	I	F	0.40
472	International	Eval of Mungbeans	73	76	0.10	I	F	0.10
473	International	Improve Mungbeans	73	80	2.50	I	F	2.50
474	International	New Tech for Rural dev	74	77	0.80	I	P	0.10
475	International	Dev Hi Yield Sorghum	74	79	0.80	I	F	0.80
476	International	Tropical adapt of Sorghum	74	77	0.20	I	F	0.20
477	International	Sorghum Pest Resistance	74	79	1.10	I	F	1.10
478	International	Improve of Barley	74	74	0.90	I	F	0.90
479	International	Soil families-Hawaii	74	83	7.40	I	F	7.40
480	International	Info on Food stuff for Lvsk	75	82	0.90	I	P	0.20
481	International	IFDC	75	94	76.40	I	P	15.00
482	International	Moisture Util in Semi Arid	75	76	1.00	I	F	1.00
483	International	Dryland Farming Oregon	75	75	1.00	I	F	1.00
484	International	CONTX Grazing Ruminants	75	82	1.80	I	F	1.80
485	International	Benchmark Soils PR	75	79	2.30	I	F	2.30
486	International	CONTX Fix Symb Trop Leg	75	88	11.30	I	F	11.30
487	International	Pest Mgmt Root Knot Nem.	75	83	2.90	I	F	2.90
488	International	World Rhizobium Coll. Ctr.	76	85	1.30	I	F	1.30
489	International	Agro-Econ Res. on Trop. Soil	76	80	1.00	I	F	1.00
490	International	CONTWeed Control Util	76	84	3.70	I	P	1.90
491	International	Soybean Utiliz.	76	79	1.40	I	P	0.70
492	International	CONTN Fix. Res. & Trng	76	76	0.10	I	P	0.10
493	International	CONTN Fix Limit Factors	76	89	0.50	I	F	0.50
494	International	Spring & Winter Wheat	76	95	10.20	I	F	10.20
495	International	Computerize Agri Info Syst	76	78	0.20	I	P	0.10
496	International	Potential of Soil Resource in Trop	76	83	1.30	I	F	1.30
497	International	Soil Micro & Minerology	76	83	1.40	I	F	1.40

Annex 1 (continued)

	Country	Project title	Starting fiscal year	Ending fiscal year of obligation	Total commitment (\$million)	National, Regional, or International	Free standing, partial, or education	Estimated research funding (\$million)
498	International	N Fix Non-Symbio Assoc Co	77	82	1.20	I	P	0.60
499	International	Determinants of Irr Problems	77	81	0.40	I	F	0.40
500	International	Agri. Mechanization	77	81	1.00	I	F	1.00
501	International	Improve. of Pearl Millet	77	80	0.80	I	F	0.80
502	International	Knowledge Synth for Policy	77	81	1.60	I	P	0.10
503	International	Aflatoxin Reduction in Maize	77	83	0.50	I	F	0.50
504	International	Compre. Plan for Rural Dev.	77	81	0.80	I	P	0.10
505	International	Small Farm Tech & Mark An	77	83	0.80	I	F	0.80
506	International	Water Mgmt Res.	78	79	10.20	I	F	10.20
507	International	Improve. of Trop. Prod. Beans	78	80	2.60	I	F	2.60
508	International	Farming Syst. R&D Methodology	78	81	1.20	I	F	1.20
509	International	Deforestation & Development	78	78	0.20	I	F	0.20
510	International	Aquaculture Tech Dev.	78	87	3.80	I	F	3.80
511	International	Cons/Prod/Nutr Data-Farm Househ	78	80	0.50	I	P	0.30
512	International	Control of Barley Disease	78	84	1.70	I	F	1.70
513	International	Nutr Plann for IARC's	79	82	0.50	I	F	0.50
514	International	Title XII Strengthen Grants	79	89	40.40	I	E	40.40
515	International	Research Econ-RSSA	79	79	0.10	I	F	0.10
516	International	Integrated Protection Method	79	81	0.40	I	F	0.40
517	International	Pest Management Capability	79	96	0.30	I	F	0.30
518	International	Tissue Culture for Food Prod.	80	83	0.90	I	F	0.90
519	International	Project Assistance	81	82	0.10	I	F	0.10
520	International	Ag Tech Res. & Dev.	81	95	13.00	I	P	6.50
521	International	Innovative Sci Res.	81	90	98.60	I	P	9.90
522	International	Fisheries Dev. Support	82	95	4.00	I	P	0.40
523	International	IBSNAT	82	92	9.90	I	F	9.90
524	International	Internat'l Water Mgmt Cntr	82	84	0.10	I	F	0.10
525	International	Water Mgmt Synth II	82	87	14.50	I	P	1.50
526	International	Agroforestry	82	95	32.40	I	P	16.20
527	International	Integrated Support for Sm farm	82	87	6.10	I	P	5.60
528	International	Pre/Post Harv Rodnt/Bird Cont	83	92	12.80	I	P	6.40
529	International	Biotech for Tissue Culture	84	95	5.00	I	F	5.00
530	International	Crop Nematode Res & Cont	84	84	1.00	I	F	1.00

Annex 1 (continued)

	Country	Project title	Starting fiscal year	Ending fiscal year of obligation	Total commitment (\$million)	National, Regional, or International	Free standing, partial, or education	Estimated research funding (\$million)
531	International	ReproStudy Milkfish	84	94	15.10	I	F	15.10
532	International	HBCU Res. Grants	84	95	41.20	I	P	4.10
533	International	Soybean Util & Res.	85	93	11.90	I	F	11.90
534	International	Collaborative Res. IARC's	85	93	4.20	I	F	4.20
535	International	IPM & Envir Prot.	85	91	5.80	I	F	5.80
536	International	PostHarv Grain Syst R&D	85	93	6.70	I	P	4.30
537	International	US-Israel Coop Dev Res Prog	85	95	24.00	I	P	2.40
538	International	Forestry/Fuelw R&D	85	94	57.80	I	P	43.40
539	International	Heifer project Intern'l	85	87	1.40	I	P	0.20
540	International	R&D Improved Seed Prod/Util	86	93	6.80	I	F	6.80
541	International	Impr. Bio-N Fix Thru Biotech	86	95	9.70	I	F	9.70
542	International	Improvd An. Vaccine Thru Biotech	86	94	12.00	I	F	12.00
543	International	Aquaculture Res. & Support	88	92	1.30	I	P	0.80
544	International	Access to Land/Wtr/NatRes	89	98	12.00	I	P	6.00
545	International	Single MOU's Agr.	89	93	5.20	I	P	1.70
546	International	PostHarvest Coll Agribus Supp	91	99	2.40	I	P	1.00
547	International	Agro Biotech for Sust product	91	96	9.70	I	P	4.80
548	International	Food Security II	92	101	5.00	I	F	5.00
549	International	CRSP- Fish/Aquacul Plan	77	80	0.70	I	F	0.70
550	International	CRSP-Plan for Sm. Rumin.	77	79	3.20	I	F	3.20
551	International	CRSP-Bean/Cowpea Plan	78	80	0.40	I	F	0.40
552	International	CRSP-Small Ruminant	78	96	53.34	I	F	53.34
553	International	CRSP-Sorghum/Millet	79	96	51.20	I	F	51.20
554	International	CRSP-Soils-Plan	79	80	0.40	I	F	0.40
555	International	CRSP-Bean/Cowpea	80	96	47.46	I	F	47.46
556	International	CRSP-Peanuts Plan	80	80	0.40	I	F	0.40
557	International	CRSP-Soil Management	81	95	39.59	I	F	39.59
558	International	CRSP-Pond Dynamics	82	96	16.04	I	F	16.04
559	International	CRSP-Peanuts	82	95	22.68	I	F	22.68
560	International	CRSP-Fisheries Stock Assmt	85	95	5.60	I	F	5.60
561	International	CRSP-SANREM Plan	90	91	2.30	I	F	2.30
562	International	CRSP-SANREM	91	96	11.93	I	F	11.93
563	International	CRSP-IPM Plan	92	95	2.00	I	F	2.00
564	International	CRSP-IPM	93	96	4.90	I	F	4.90
565	International	IARC-IRRI	68	95	102.70	I	F	102.70
566	International	IARC-IITA	68	95	108.20	I	F	108.20
567	International	IARC-AVRDC	68	95	18.40	I	F	18.40
568	International	IARC-ICRISAT	68	95	73.50	I	F	73.50
569	International	IARC-CIP	68	95	40.30	I	F	40.30
570	International	IARC-ILCA	68	95	49.80	I	F	49.80

Annex 1 (concluded)

<i>Country</i>	<i>Project title</i>	<i>Starting fiscal year</i>	<i>Ending fiscal year of obliga- tion,</i>	<i>Total commit- ment (\$million)</i>	<i>National, Regional, or Inter- national</i>	<i>Free standing, partial, or educa- tion</i>	<i>Estimated research funding (\$million)</i>
571	International IARC-WARDA	68	95	1.35	I	F	1.35
572	International IARC-ICARDA	68	95	73.00	I	F	73.00
573	International IARC-ISNAR	68	95	15.10	I	F	15.10
574	International IARC-CIMMYT	69	69	109.53	I	F	109.53
575	International IARC-CIAT	70	96	90.65	I	F	90.65
576	International IARC-ILRAD & ILRI	74	95	47.60	I	F	47.60
577	International IARC-IBPGR & IPGRI	75	96	16.50	I	F	16.50
578	International CGIAR Data Comm. Eng.	77	78	0.10	I	F	0.10
579	International IARC-ICLARM-Fisheries	79	95	4.60	I	F	4.60
580	International IARC-IFPRI	80	96	23.65	I	F	23.65
581	International IARC-IIMI	84	96	3.65	I	F	3.65
582	International IARC-IBSRAM	85	96	0.60	I	F	0.60
583	International IARC-INIBAP	89	96	0.40	I	F	0.40
584	International IARC-ICIPE	90	96	0.60	I	F	0.60
585	International IARC-CIFOR	92	96	1.85	I	F	1.85
586	International IARC-ICRAF	92	96	1.90	I	F	1.90
587	International CRSP-BASIS	96	96	0.80	I	F	0.80
Total				6,988.58			3,622.12

Note: Project research funding levels are estimates.

Annex 2. USAID Research Related Funding By Year and By Category
(\$ Million)

<i>Program category</i>	<i>1952</i>	<i>1953</i>	<i>1954</i>	<i>1955</i>	<i>1956</i>	<i>1957</i>	<i>1958</i>	<i>1959</i>	<i>1960</i>	<i>1961</i>	<i>1962</i>	<i>1963</i>
NARS support	0.29	0.29	0.62	0.62	0.62	0.81	0.81	0.84	0.84	0.84	6.68	3.60
University development	0.00	0.00	0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.28	2.20
Global programs	0.00	0.00	0.00	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11
IARC support	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRSP programs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.29	0.29	0.62	0.72	1.00	1.20	1.21	1.24	1.24	1.24	7.08	5.92
Country programs	0.29	0.29	0.62	0.62	0.90	1.10	1.10	1.13	1.13	1.13	6.96	5.81
Global programs	0.00	0.00	0.00	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11

<i>Program category</i>	<i>1964</i>	<i>1965</i>	<i>1966</i>	<i>1967</i>	<i>1968</i>	<i>1969</i>	<i>1970</i>	<i>1971</i>	<i>1972</i>	<i>1973</i>	<i>1974</i>	<i>1975</i>
NARS support	4.19	4.29	4.45	6.78	7.43	9.15	32.32	14.82	15.58	16.14	17.19	21.61
University development	2.41	3.42	3.49	4.04	4.04	4.22	5.28	6.13	6.13	6.13	6.80	9.58
Global programs	0.11	0.13	0.87	1.21	1.46	1.97	4.90	2.60	2.70	3.78	5.73	8.86
IARC support	0.00	0.00	0.00	0.00	0.00	0.40	1.70	3.00	3.50	5.80	7.90	11.20
CRSP programs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	6.71	7.84	8.82	12.03	12.93	15.74	44.19	26.56	27.92	31.85	37.62	51.25
Country programs	6.60	7.71	7.94	10.82	11.47	13.37	37.59	20.95	21.71	22.27	23.99	31.19
Global programs	0.11	0.13	0.87	1.21	1.46	2.37	6.60	5.60	6.20	9.58	13.63	20.06

Annex 2 (concluded)

<i>Program category</i>	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
NARS support	29.82	42.27	53.07	60.11	68.08	69.41	74.82	71.44	85.10	108.13	106.75	108.54
University development	14.84	7.62	10.17	19.30	18.36	18.10	18.10	20.51	22.45	23.48	23.93	23.38
Global programs	9.39	9.55	16.58	20.27	13.38	13.10	15.34	14.97	16.16	21.50	24.52	24.52
IARC support	15.70	18.45	22.15	26.10	29.60	36.00	41.90	44.90	46.40	46.70	48.30	41.60
CRSP programs	0.00	3.90	5.10	8.10	6.80	8.30	15.30	14.60	11.90	15.60	14.20	12.70
Total	69.76	81.79	107.06	133.87	136.23	144.91	165.46	166.43	182.01	215.41	217.70	210.74
Country programs	44.66	49.89	63.24	79.40	86.44	87.51	92.92	91.95	107.55	131.61	130.68	131.92
Global programs	25.09	31.90	43.83	54.47	49.78	57.40	72.54	74.47	74.46	83.80	87.02	78.82

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<i>Program category</i>	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total
NARS support	97.46	106.06	102.39	90.33	74.82	73.99	64.13	56.35	27.85	1741.73
University development	19.69	21.67	22.39	24.97	12.20	9.74	9.74	6.00	3.00	415.50
Global programs	23.05	23.19	19.48	19.38	19.06	17.36	13.90	6.10	2.03	378.17
IARC support	43.40	41.40	41.90	43.30	44.10	39.00	28.80	28.33	22.45	783.98
CRSP programs	13.50	14.30	16.40	17.80	20.80	17.60	12.30	16.29	17.45	262.94
Total	197.11	206.61	202.55	195.79	170.97	157.69	128.87	113.08	72.78	3582.31
Country programs	117.15	127.73	124.78	115.30	87.02	83.73	73.88	62.35	30.85	2157.23
Global programs	79.95	78.89	77.78	80.48	83.96	73.96	55.00	50.72	41.93	1425.09

Notes: Totals do not equal total funding for research programs in Table 1 of text, since funding for some projects runs beyond 1996. University development funding \$40.4 Million for global program is included in Global Program category.

Annex 3. USAID Core Funding for International Agricultural Research Centers By Year

(\$ million)

<i>Project title</i>	<i>1968</i>	<i>1969</i>	<i>1970</i>	<i>1971</i>	<i>1972</i>	<i>1973</i>	<i>1974</i>	<i>1975</i>	<i>1976</i>	<i>1977</i>
IARC-IRRI	0.00	0.00	0.50	1.00	0.80	0.70	1.10	1.90	2.20	3.00
IARC-IITA	0.00	0.00	0.30	0.50	0.70	1.20	1.50	2.10	2.50	2.80
IARC-AVRDC	0.00	0.00	0.00	0.00	0.00	0.60	0.80	0.60	0.60	0.60
IARC-ICRISAT	0.00	0.00	0.00	0.00	0.10	0.70	1.00	2.10	1.90	1.00
IARC-CIP	0.00	0.00	0.00	0.00	0.10	0.30	0.60	0.60	1.00	1.40
IARC-ILCA	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	1.20	2.10
IARC-WARDA	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.20
IARC-ICARDA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20	1.00
IARC-ISNAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-CIMMYT	0.00	0.40	0.60	0.80	1.10	1.50	1.40	1.80	2.60	2.60
IARC-CIAT	0.00	0.00	0.30	0.70	0.70	0.80	1.00	1.20	1.70	2.30
IARC-ILRAD/ILRI	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.50	1.50	1.20
IARC-IBPGR/IPGRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.20
CGIAR Data Comm. Eng.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
IARC-ICLARM-Fisheries	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-IFPRI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-IIMI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-IBSRAM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-INIBAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-ICIPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-CIFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-ICRAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.40	1.70	3.00	3.50	5.80	7.90	11.20	15.70	18.45

Annex 3 (continued)

<i>Project title</i>	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
IARC-IRRI	3.40	3.60	3.80	4.30	5.90	6.30	6.00	5.90	6.00	5.20
IARC-IITA	3.50	3.90	3.80	4.70	5.90	6.20	6.30	6.20	6.30	5.40
IARC-AVRDC	0.60	0.70	0.60	0.70	0.80	0.80	1.00	1.00	1.00	1.00
IARC-ICRISAT	1.20	1.50	2.10	2.90	3.90	4.40	4.80	4.80	4.80	4.20
IARC-CIP	1.60	1.50	1.70	2.20	2.20	2.30	2.30	2.30	2.30	2.00
IARC-ILCA	1.60	1.80	2.20	2.40	2.60	2.80	3.20	3.20	3.50	3.00
IARC-WARDA	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-ICARDA	1.90	2.90	3.00	3.20	3.60	5.00	5.30	5.50	5.60	4.80
IARC-ISNAR	0.00	0.00	0.20	0.60	1.00	0.90	0.90	0.90	1.00	0.80
IARC-CIMMYT	2.80	3.60	4.20	5.60	6.60	6.00	6.00	6.00	6.10	5.20
IARC-CIAT	2.60	3.30	3.60	4.40	4.90	5.40	5.60	5.50	5.60	4.80
IARC-ILRAD/ILRI	2.00	2.40	2.80	3.10	2.40	2.50	2.50	2.50	2.50	2.20
IARC-IBPGR/IPGRI	0.50	0.60	0.80	0.80	0.80	0.90	0.90	0.90	1.00	0.80
CGIAR Data Comm. Eng.	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-ICLARM-Fisheries	0.00	0.30	0.20	0.30	0.30	0.30	0.00	0.30	0.80	0.30
IARC-IFPRI	0.00	0.00	0.60	0.80	1.00	1.10	1.40	1.40	1.50	1.50
IARC-IIMI	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.20	0.30
IARC-IBSRAM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10
IARC-INIBAP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-ICIPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-CIFOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IARC-ICRAF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	22.15	26.10	29.60	36.00	41.90	44.90	46.40	46.70	48.30	41.60

Annex 3 (concluded)

Project title	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	Total
IARC-IRRI	5.20	5.20	5.30	5.40	5.40	5.00	3.40	3.30	2.90	3.50	106.20
IARC-IITA	6.40	5.40	5.50	5.80	5.70	5.00	3.70	3.90	3.00	3.30	111.50
IARC-AVRDC	1.00	1.00	1.00	1.00	1.00	1.00	0.70	0.30	0.00	0.00	18.40
IARC-ICRISAT	4.20	4.10	4.00	4.10	4.20	3.80	2.80	2.90	2.00	2.20	75.70
IARC-CIP	2.00	2.00	2.20	2.20	2.40	2.00	1.20	1.10	0.80	0.93	41.23
IARC-ILCA	4.00	3.00	2.90	3.00	3.00	2.20	1.90	0.00	0.00	0.00	49.80
IARC-WARDA	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.15	0.20	1.55
IARC-ICARDA	4.60	4.60	4.40	4.50	4.20	3.50	2.00	1.85	1.25	1.48	74.48
IARC-ISNAR	0.90	1.00	1.10	1.30	1.30	1.20	0.80	0.70	0.50	0.60	15.70
IARC-CIMMYT	5.20	5.20	5.30	5.40	5.60	5.30	4.40	4.23	4.00	4.35	113.88
IARC-CIAT	4.80	4.80	4.70	4.90	4.70	4.00	3.20	3.05	2.10	2.37	93.02
IARC-ILRAD/ILRI	2.20	2.10	2.00	1.90	2.00	1.70	1.30	3.40	2.60	3.00	50.60
IARC-IBPGR/IPGRI	0.80	0.80	1.00	1.20	1.20	1.00	0.80	0.70	0.50	0.60	17.10
CGIAR Data Comm. Eng.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
IARC-ICLARM-Fisheries	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.25	0.25	0.40	5.00
IARC-IFPRI	1.60	1.60	1.60	1.70	1.80	1.70	1.50	1.50	1.35	1.63	25.28
IARC-IIMI	0.30	0.30	0.30	0.30	0.40	0.40	0.20	0.25	0.30	0.45	4.10
IARC-IBSRAM	0.10	0.00	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.60
IARC-INIBAP	0.00	0.10	0.00	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.40
IARC-ICIPE	0.00	0.00	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.60
IARC-CIFOR	0.00	0.00	0.00	0.00	0.50	0.40	0.20	0.35	0.40	0.75	2.60
IARC-ICRAF	0.00	0.00	0.00	0.00	0.40	0.40	0.40	0.35	0.35	0.60	2.50
Total	43.40	41.40	41.90	43.30	44.10	39.00	28.80	28.33	22.45	26.35	810.33

Notes: Does not include direct Mission funding for bilateral program support. Due to rounding errors totals differ slightly from USAID/AFS funding data.

Annex 4. Estimated Collaborative Research Support Program Funding By Fiscal Year
 (\$million)

<i>Project title</i>	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
CRSP- Fish/Aquacul Plan	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRSP-Plan for Sm. Rumin.	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRSP-Bean/Cowpea Plan	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRSP-Small Ruminant	0.00	4.70	2.70	3.20	0.60	3.20	3.70	4.60	4.00	2.60	2.00
CRSP-Sorghum/Millet	0.00	0.00	5.00	2.50	1.90	3.80	0.60	4.40	4.30	2.20	2.20
CRSP-Soils-Plan	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRSP-Bean/Cowpea	0.00	0.00	0.00	0.70	5.00	4.10	4.20	0.00	2.70	2.60	3.00
CRSP-Peanuts Plan	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRSP-Soil Management	0.00	0.00	0.00	0.00	0.80	2.70	2.00	2.20	2.80	2.60	2.00
CRSP-Pond Dynamics	0.00	0.00	0.00	0.00	0.00	0.60	0.60	0.70	1.30	1.00	1.00
CRSP-Peanuts	0.00	0.00	0.00	0.00	0.00	0.90	3.50	0.00	0.00	2.40	1.60
CRSP-Fisheries Stock Assmt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.80	0.90
CRSP-SANREM Plan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRSP-SANREM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRSP-IPM Plan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRSP-IPM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRSP-BASIS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	3.90	5.10	8.10	6.80	8.30	15.30	14.60	11.90	15.60	14.20	12.70

Notes: CRSP design funding included and allocated by initial year of funding. Nutrition CRSP information is not included.

Annex 4 (concluded)

<i>Project Title</i>	<i>1988</i>	<i>1989</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>Total</i>
CRSP- Fish/Aquacul Plan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70
CRSP-Plan for Sm. Rumin.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20
CRSP-Bean/Cowpea Plan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
CRSP-Small Ruminant	2.80	2.80	2.80	3.40	3.00	2.70	0.00	2.20	2.04	2.39	55.43
CRSP-Sorghum/Millet	2.70	2.70	2.80	3.20	2.90	2.70	2.30	2.46	2.54	2.73	53.93
CRSP-Soils-Plan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
CRSP-Bean/Cowpea	2.60	3.30	2.20	3.30	3.80	1.90	3.30	2.36	2.40	2.74	50.20
CRSP-Peanuts Plan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
CRSP-Soil Management	2.10	2.20	2.20	4.00	4.60	4.30	0.00	2.30	2.79	1.13	40.72
CRSP-Pond Dynamics	0.90	0.90	0.90	1.10	1.00	1.00	1.80	1.30	2.25	2.20	18.55
CRSP-Peanuts	1.70	1.70	2.30	2.40	1.10	1.70	0.00	1.44	1.94	1.93	24.61
CRSP-Fisheries Stock Assmt	0.70	0.70	0.90	0.40	0.60	0.10	0.00	0.00	0.00	0.00	5.60
CRSP-SANREM Plan	0.00	0.00	2.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30
CRSP-SANREM	0.00	0.00	0.00	0.00	1.80	2.30	3.80	2.73	1.30	1.65	13.58
CRSP-IPM Plan	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	2.00
CRSP-IPM	0.00	0.00	0.00	0.00	0.00	0.90	1.10	1.50	1.40	1.50	6.40
CRSP-BASIS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	1.28	2.08
Total	13.50	14.30	16.40	17.80	20.80	17.60	12.30	16.29	17.46	17.54	280.49

Note: Nutrition CRSP information is not included.

Annex 5. USAID Technical Staffing Levels by Year

Year	Authorized Positions				Staffing Level			
	Agriculture	Rural Development	Environment	Total	Agriculture	Rural Development	Environment	Total
12/31/77	242	N.A.	N.A.	N.A.	175	N.A.	N.A.	N.A.
9/30/80	272	N.A.	N.A.	N.A.	217	N.A.	N.A.	N.A.
9/30/85	278	38	12	328	248	35	11	294
9/30/90	233	19	12	264	210	19	10	239
9/30/95	120	8	41	169	102	8	24	134
6/30/96	107	4	49	160	93	4	38	135
9/30/96	N.A.	N.A.	N.A.	N.A.	84	3	38	125

Note: Data for 9/30/96 staffing levels is high estimate based on assumption of no attrition other than reduction-in-force. Other data is from USAID/HR.

Annex 6. USAID Research Related Funding By Year and By Region

(\$ Million)

<i>Region/Category</i>	<i>1952</i>	<i>1953</i>	<i>1954</i>	<i>1955</i>	<i>1956</i>	<i>1957</i>	<i>1958</i>	<i>1959</i>	<i>1960</i>	<i>1961</i>	<i>1962</i>	<i>1963</i>
Asia/Bilateral	0.29	0.29	0.62	0.62	0.90	1.10	1.10	1.10	1.10	1.10	1.10	3.29
Asia/Regional	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03	0.03
Sub-Total	0.29	0.29	0.62	0.62	0.90	1.10	1.10	1.13	1.13	1.13	1.13	3.32
Africa/Bilateral	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10
Africa/Regional	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10
Europe/Bilateral	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAC/Bilateral	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.74	2.39
LAC/Regional	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.74	2.39
Near East/Bilateral	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Near East/Regional	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Global/Misc.	0.00	0.00	0.00	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11
Global/IARCs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Global/CRSPs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	0.00	0.00	0.00	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11
Total	0.29	0.29	0.62	0.72	1.00	1.20	1.21	1.24	1.24	1.24	7.08	5.92

Note: Funding for some projects continues beyond 1996.

Annex 6 (continued)

<i>Region/Category</i>	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Asia/Bilateral	3.94	3.94	4.05	6.23	6.47	7.27	8.33	8.71	8.71	9.01	10.29	11.46
Asia/Regional	0.03	0.03	0.03	0.58	0.80	1.04	1.04	1.54	1.54	1.54	1.48	1.48
Sub-Total	3.97	3.97	4.08	6.80	7.27	8.31	9.37	10.25	10.25	10.55	11.78	12.95
Africa/Bilateral	0.10	1.18	1.25	1.25	1.25	1.30	1.64	3.15	3.15	3.24	3.52	4.17
Africa/Regional	0.02	0.02	0.02	0.05	0.05	0.32	1.84	1.82	2.16	2.16	2.38	2.87
Sub-Total	0.12	1.20	1.27	1.30	1.30	1.62	3.48	4.97	5.30	5.40	5.90	7.04
Europe/Bilateral	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
LAC/Bilateral	2.51	2.54	2.59	2.69	2.69	3.06	15.00	4.44	4.87	4.91	4.91	7.33
LAC/Regional	0.00	0.00	0.00	0.00	0.00	0.00	9.20	0.75	0.75	0.82	0.82	0.75
Sub-Total	2.51	2.54	2.59	2.69	2.69	3.06	24.20	5.19	5.62	5.73	5.73	8.08
Near East/Bilateral	0.00	0.00	0.00	0.03	0.21	0.39	0.54	0.54	0.54	0.59	0.59	3.05
Near East/Regional	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	0.00	0.00	0.00	0.03	0.21	0.39	0.54	0.54	0.54	0.59	0.59	3.05
Global/Misc.	0.11	0.13	0.87	1.21	1.46	1.97	4.90	2.60	2.70	3.78	5.73	8.86
Global/IARCs	0.00	0.00	0.00	0.00	0.00	0.40	1.70	3.00	3.50	5.80	7.90	11.20
Global/CRSPs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-Total	0.11	0.13	0.87	1.21	1.46	2.37	6.60	5.60	6.20	9.58	13.63	20.06
Total	0.29	0.29	0.62	0.72	1.00	1.20	1.21	1.24	1.24	1.24	7.08	5.92

Note: Funding for some projects continues beyond 1996.

Annex 6 (continued)

Region/Category	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Asia/Bilateral	22.06	20.85	21.04	18.00	22.08	24.74	25.03	25.97	39.60	43.58	45.63	42.25
Asia/Regional	1.26	0.76	0.76	0.73	0.55	0.55	0.55	0.55	0.55	0.55	0.00	0.23
Sub-Total	23.32	21.61	21.80	18.73	22.62	25.29	25.58	26.52	40.15	44.13	45.63	42.49
Africa/Bilateral	7.03	9.60	18.03	25.45	26.77	29.83	34.88	21.95	25.44	27.92	30.03	30.12
Africa/Regional	2.89	2.52	4.55	4.16	3.63	4.03	8.60	10.97	13.13	11.09	10.61	9.06
Sub-Total	9.91	12.12	22.58	29.61	30.40	33.86	43.48	32.92	38.57	39.01	40.64	39.18
Europe/Bilateral	0.08	0.08	0.08	0.08	3.58	0.08	0.08	0.08	0.08	0.08	0.08	0.08
LAC/Bilateral	7.29	8.32	5.74	6.12	7.25	7.20	5.90	14.56	11.22	11.59	11.99	17.46
LAC/Regional	2.17	1.67	2.03	2.90	1.58	3.51	1.36	1.36	2.45	2.81	2.94	3.31
Sub-Total	9.46	9.99	7.77	9.03	8.83	10.71	7.27	15.92	13.67	14.40	14.93	20.78
Near East/Bilateral	1.89	6.10	11.01	21.96	21.01	17.57	15.26	15.26	13.83	32.75	28.89	28.89
Near East/Regional	0.00	0.00	0.00	0.00	0.00	0.00	1.25	1.25	1.25	1.25	0.50	0.50
Sub-Total	1.89	6.10	11.01	21.96	21.01	17.57	16.51	16.51	15.08	34.00	29.39	29.39
Global/Misc.	9.39	9.55	16.58	20.27	13.38	13.10	15.34	14.97	16.16	21.50	24.52	24.52
Global/IARCs	15.70	18.45	22.15	26.10	29.60	36.00	41.90	44.90	46.40	46.70	48.30	41.60
Global/CRSPs	0.00	3.90	5.10	8.10	6.80	8.30	15.30	14.60	11.90	15.60	14.20	12.70
Sub-Total	25.09	31.90	43.83	54.47	49.78	57.40	72.54	74.47	74.46	83.80	87.02	78.82
Total	69.76	81.79	107.06	133.87	136.23	144.91	165.46	166.43	182.01	215.41	217.70	210.74

Note: Funding for some projects continues beyond 1996.

Annex 6 (concluded)

<i>Region/Category</i>	<i>1988</i>	<i>1989</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>total</i>
Asia/Bilateral	32.78	31.46	25.44	18.04	6.79	6.43	3.72	3.72	1.49	581.68
Asia/Regional	0.23	0.23	0.23	0.23	0.23	0.00	0.00	0.00	0.00	19.50
Sub-Total	33.01	31.70	25.67	18.27	7.02	6.43	3.72	3.72	1.49	601.18
Africa/Bilateral	30.28	39.03	43.21	39.73	27.50	23.62	26.31	18.97	14.51	575.62
Africa/Regional	9.06	9.04	9.34	13.22	16.14	16.40	10.80	10.80	8.47	202.20
Sub-Total	39.34	48.07	52.55	52.95	43.63	40.02	37.11	29.77	22.97	777.81
Europe/Bilateral	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.70
LAC/Bilateral	14.49	15.31	13.90	14.87	11.82	13.30	9.34	8.61	6.30	288.22
LAC/Regional	2.31	2.65	1.74	1.40	1.40	0.84	0.84	0.34	0.00	52.70
Sub-Total	16.80	17.96	15.64	16.27	13.22	14.14	10.18	8.95	6.30	340.92
Near East/Bilateral	27.42	29.42	30.42	27.31	22.64	22.64	22.36	19.42	0.08	422.62
Near East/Regional	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.00	10.00
Sub-Total	27.92	29.92	30.92	27.81	23.14	23.14	22.86	19.92	0.08	432.62
Global/Misc.	23.05	23.19	19.48	19.38	19.06	17.36	13.90	6.10	2.03	378.17
Global/IARCs	43.40	41.40	41.90	43.30	44.10	39.00	28.80	28.33	22.45	783.98
Global/CRSPs	13.50	14.30	16.40	17.80	20.80	17.60	12.30	16.29	17.45	262.94
Sub-Total	79.95	78.89	77.78	80.48	83.96	73.96	55.00	50.72	41.93	1425.09
Total	197.11	206.61	202.55	195.79	170.97	157.69	128.87	113.08	72.78	3582.31

Note: Funding for some projects continues beyond 1996.

Annex 7

USAID Special Interest Code Reporting on Agricultural Research Funding Obligations

Beginning in FY 1989, USAID established a system for reporting on project funding obligations by Activity Code (AC) and Special Interest Code (SI). One Special Interest Code for "Agricultural Research" is defined as including:

"activities carried out at LDC institutions, in the U.S., or at International Agricultural Research Centers (IARCs) that support agronomic research, including on-station, on-farm, and farming systems research. Includes the development of improved agricultural practices and economic, social and technical research as it relates to agricultural programs."

Reported obligations for this funding code are as follows:

<i>Fiscal Year</i>	<i>US \$Million</i>
1989	Not Available
1990	91.93
1991	81.79
1992	33.83
1993	66.85
1994	41.65
1995	58.46
1996	38.39 (preliminary)

The Special Interest Codes are based on U.S. Government standard definitions for classification of research activities. The "Agricultural Research" Code would appear to cover most USAID funded activities related to support for agricultural research, but the funding obligations reported under this Special Interest Code are substantially lower (at only 30 to 50 percent) than those estimated in this Paper. Though the funding estimates contained in this Paper are approximations and are not exact, the SI Code would appear to substantially under-report the level of USAID support to agricultural research. This is most obvious in that for two years (1992 and 1996) the SI Code data on agricultural research funding is less than the funding for the CRSPs and IARCs for those years.

Review of the SI Code reporting system and definitions for Special Interest Codes suggests the following reasons for the differences in the estimates of research support:

- specific exclusion of funding for experimental production, routine monitoring and evaluation, and training of scientific and technical personnel. Training has been a major component of most USAID programs supporting agricultural research capacity building;

- specific exclusion of research classified as “Environmental Biological Research,” including research on ecology, systematics, soils, water resource management, forestry, and environmental biology;
- specific exclusion of “Social Science Research,” including among other issues economic research, modeling research, interaction of socio-economic and natural variables, and others;
- likely exclusion of some research-related institution building programs, such as university development and private sector research support;
- possible exclusion of some research activities classified as “Basic Research” and “Development”; and
- likelihood of errors of omission in coding, especially for research components within projects involving other Special Interest and Activity Codes.

References

- Alston, J. A. and Pardey, P. G. 1996. *Making Science Pay: The Economics of Agricultural R & D Policy*. Washington, D. C., AEI Press.
- Anderson, J. R., P. G. Pardey, and J. Roseboom. 1994. "Sustaining Growth in Agriculture: A Quantitative Review of Agricultural Research Investments." *Agricultural Economics* 10: 107-23.
- Antholt, C. H. 1994. Getting Ready for the Twenty-First Century: Technical Change and Institutional Modernization in Agriculture. World Bank Technical Paper No. 217. Washington, D.C. The World Bank.
- Antholt, C. H. 1995. *Innovative Approaches: Back to the Basics*. In Proceedings of the 31st Annual Meeting of the Association for International Agriculture and Rural Development, June 5-6, 1995. Washington, D. C.
- Barghouti, S., Cromwell, E., and Pritchard, A. J. 1993. *Agricultural Technologies for Market-Led Development Opportunities in the 1990s*. World Bank Technical Paper No. 204. Washington, D. C., The World Bank.
- Bathrick, D. D., Byrnes, K. J., Stovall, J. G., and Podems, D. G. 1996. *Technology Institutions for Agricultural Free Trade in the Americas (TIAFTA)*. Washington, D. C. LAC TECH Project. USAID.
- Byrnes, K. J. 1990. *A Review of AID Experience With Farming Systems Research and Extension Projects*. AID Evaluation Special Study No. 67. Washington, D. C., USAID.
- Bergmark, C. L., Byrnes, F. C., Miller, R. J. Gray, C. C., and Ives, C. L. 1996. *Administrative Management Review of the Bean/Cowpea Collaborative Research Support Program*. Washington, D. C. USAID.
- Blase, M., Farrington, J., de Lattre-Gasquet, M., Gilbert, E., and Ruttan, V. 1995. *Concept Paper on Agricultural Research-Draft*. USAID.
- Block, S. and Timmer, C. P. 1994. *Agriculture and Economic Growth: Conceptual Issues and the Kenyan Experience*. CAER Discussion Paper No. 26. Washington, D.C. CAER Project, Harvard Institute for International Development, USAID.
- Collins, W. 1996. *US University Collaboration With International Agricultural Research Centers, 1990-1995*. Draft Paper. Washington, D. C., ESDAR, World Bank.
- Crawford, P. R. 1982. *AID Experience in Agricultural Research: A Review of Project Evaluations*. AID Program Evaluation Paper No. 13. Washington, D. C., Office of Evaluation, USAID.
- Echevarria, R. G. 1990. Assessing the Impact of Agricultural Research. In ISNAR, *Methods for*

- Diagnosing Research System Constraints and Assessing the Impact of Agricultural Research: Vol. II Assessing the Impact of Agricultural Research. The Hague. ISNAR.
- Echeverria, R. G., Trigo, E. J., and Byerlee, D. 1996. *Institutional Change and Effective Financing of Agricultural Research in Latin America*. Working Paper Based on Regional Workshop August 8-9, 1995 Funded By the IDB and World Bank in Buenos Aires, Argentina.
- Edwards, D. T. and Farrington, J. 1993. Review of the Factors Influencing the Uptake and Impact of a Sample of Twenty-One UK-Supported Renewable Natural Resource Research Projects. Agricultural Administration Network Paper No. 43. London. Department for International Development.
- ESDAR. 1995. The Emergence of a Global Agricultural Research System and the Role of ESDAR. Draft Paper. Washington, D.C., ESDAR/World Bank.
- Furtick, W. R. 1989. *International Dimension for the United States Agricultural Research Agenda*. Paper Presented at the Conference on International Agricultural Research: Its Relationship to US Agricultural Productivity and Competitiveness. April 10, 1989.
- Hansen, G. E. 1989. Universities for Development: Lessons for Enhancing the Role of Agricultural Universities in developing Countries. AID Evaluation Occasional Paper No. 31. Washington, D. C., USAID.
- Horkan, K. M. and Jordan, P. L. 1996. *Endowments as a Tool for Sustainable Development*. Washington, D. C., Center for Development Information and Evaluation, USAID.
- IFPRI. 1995. *A 2020 Vision for Food, Agriculture, and the Environment: The Vision, Challenge, and Recommended Action*. Washington, D.C. IFPRI.
- Inter-American Development Bank. 1993. Summary Report on Agricultural Research and Extension Project Evaluations. Washington, D.C., IDB.
- Inter-American Development Bank. 1996. *Towards a Regional System of Technology Innovation for the Food and Agricultural Sector*. Washington, D. C., Department of Social Programs and Sustainable Development, IDB.
- Knapp, C. 1994. *Proceedings: Collaborative Research Support Program Evaluation Conference, 31 October-1 November, 1994*. Washington, D.C. USAID.
- Kumar, K. 1995. *Generating Broad-Based Growth Through Agribusiness promotion: Assessment of USAID Experience*. Washington, D.C. USAID.
- Kydd, J., Buckwell, A., and Morrison, J. 1995. The Role of the Agricultural Sector in the Transition to a Market Economy in Central and Eastern Europe: An Analytical Framework. In Symposium on the Role of Agriculture in the Transition Process Towards a Market Oriented Economy. May 4-6, 1995. London. Department of Agricultural Economics, Wye College.
- Lele, U. 1995. Building on the NARS-CGIAR Partnerships for a Doubly Green Revolution: A Framework for the IFAD-Led Initiative. Washington, D.C., ESDAR, World Bank.
- Lele, U. and R. Coffman. 1995. Global Research in the Environmental and Agricultural Nexus for the 21st Century: A Proposal for Collaborative Research Among US Universities, CGIAR Centers, and Developing Country Institutions. Report on a Taskforce on Research Innovations for Productivity and Sustainability. Cornell University and University of Florida.
- McMahon, M. 1992. Getting Beyond the "National Institute Model" for Agricultural Research in Latin America: A Cross-Country Study of Brazil, Chile, Colombia, and Mexico—Latin America and the Caribbean Technical Department Regional Studies Program Report No. 20. Washington, D. C., The World Bank.
- McClelland, D. G. 1994. *Investments in Agriculture: A Synthesis of the Evaluation Literature*. Washington, D. C., Center for Development Information and Evaluation, USAID.
- Murphy, J. 1983. Strengthening the Agricultural Research Capacity of the Less Developed Countries: Lessons from AID Experience. Washington, D.C., USAID.
- National Research Council (NRC) Commission on International Relations. 1977. *Supporting Papers: World Food and Nutrition Study: Study Team 14: Agricultural Research Organization*. Washington, D. C., National Academy of Sciences.
- Oehmke, J. F. 1995. Issues of Agricultural Technology Development and Diffusion: A Synthesis of the Literature. Bethesda, MD. Development Alternatives, Inc.

- Pardey, P. G. and Roseboom, J. 1989. ISNAR Agricultural Research Indicator Series: A Global Database on National Agricultural Research Systems. Cambridge, U.K.; Cambridge University Press.
- Pardey, P. G., Roseboom, J., and Anderson, J. R. 1991. *Agricultural Research Policy: International Quantitative Perspectives*. Cambridge, U.K.: Cambridge University Press.
- Pinstrup-Andersen, P., Lundberg, M., and Garrett, J. L. 1995. *Foreign Assistance to Agriculture: A Win-Win Proposition*. In *20/20 Food Policy Report*. Washington, D. C., IFPRI.
- Pinstrup-Andersen and Pandya-Lorch, R. 1994. *Alleviating Poverty, Intensifying Agriculture, and Effectively Managing Natural Resources: Food, Agriculture, and the Environment Discussion Paper No. 1*. In *20/20 Food Policy Study*. Washington, D. C., IFPRI.
- Preuss, H. A. and Steinacker, G. 1995. *Promoting a Participatory Approach Within National Agricultural Research Systems*. Agriculture + Rural Development, vol. 2 no. 2, 1995.
- Purcell, D. L. and J. R. Anderson. 1997. *Agricultural Extension and Research: Achievements and Problems in National Systems*. Operations Evaluation Department, The World Bank.
- Rosegrant, M. W., Agcaoili-Sombilla, M., and Perez, N. D. 1995. *Global Food Projections to 2020: Implications for Investment: Food, Agriculture, and the Environment Discussion Paper No. 5*. In *20/20 Food Policy Study*. Washington, D. C., IFPRI.
- Ruttan, V.W. 1996. *United States Development Assistance Policy: The Domestic Politics of Foreign Economic Aid*. Baltimore, MD. Johns Hopkins University Press.
- Schuh, G. E., Hecht, S. B., Henson, J. B., Lele, U., Mellor, J., Plucknett, D. L., and Stovall, J. G. 1992. *International Cooperation for Sustainable Economic Growth: The US Interest and Proposals for Revitalization*. Report of a Task Force. Washington, D. C. USAID.
- Serageldin, I., Barrett, R., and Martin-Brown, J. 1994. *The Business of Sustainable Cities: Public-Private Partnerships for Creative Technical and Institutional Solutions*. World Bank Conference on Environmentally Sustainable Development, September 22–23, 1994. Washington, D. C., The World Bank.
- Spurling, A., Pee, T. Y., Mkamanga, G., and Nkwanyana, C. 1992. *Agricultural Research in Southern Africa: A Framework for Action*. World Bank Discussion Paper No. 184. Washington, D. C., The World Bank.
- Swindale, L. D., Barrett, I., Eriksen, J., Gray, R. C., Jensen, G. L., Marlowe, G. A., Miller, C. I., and Lal, R. 1995. *An Evaluation of the USAID and Universities Collaborative Support Programs*. Washington, D.C. USAID.
- Taskforce on Research Innovations for Productivity and Sustainability. 1995. *Global Research on the Environmental and Agricultural Nexus for the 21st Century: A Proposal for Collaborative Research Among US Universities, CGIAR Centers, and Developing Country Institutions*. Gainesville, FL, Office of International Studies and Programs, University of Florida.
- Taylor, A., Boukambou, G., Dahniya, M., Ouayogode, B., Ayling, R., Noor, M. A., and Toure, M. 1996. *Strengthening National Agricultural Research Systems in the Humid and Sub-humid Zones of West and Central Africa: A Framework for Action*. World Bank Technical Paper Number 318. Washington, D.C., The World Bank.
- Technical Advisory Committee, CGIAR. 1996. *The Future Role of the CGIAR in Development of National Agricultural Research Systems: A Strategic Study of Institution Strengthening Research and Services*. TAC Secretariat, FAO.
- Tribe, D. 1994. *Feeding and Greening the World: The Role of International Agricultural Research*. Oxon, U.K.; CAB International.
- USAID. 1991. *Future Personnel Needs Assessment in Agriculture, Rural development, and Natural Resources*. Prepared for the Joint Sector Councils of Agriculture, Rural Development, and Natural Resources By Chemonics, Inc. Washington, D. C., USAID.
- USAID. 1994. *USAID Agricultural Research Survey Results*. Washington, D. C. Agency Research Council, USAID.
- USAID. 1995a. *CDIE Project Information System Database*. Washington, D.C., Center for Development Information and Evaluation/USAID.

- USAID. 1995b. *Investing in Growth*. Informational Materials Prepared for Workshop on USAID and the Food and Agricultural Sector.
- USAID. 1996. *Investments in Agriculture: A Synthesis of the Evaluation Literature*. Washington, D.C., Center for Development Information and Evaluation, USAID.
- Vollrath, T. L. 1993. *Role of Agriculture in Economic Development: A Vision for the US Development Assistance*. Washington, D.C., Economic Research Service, USDA.
- Weijenberg, J., Dagg, M., Kampen, J., Kalunda, M., Mailu, A. M., Ketema, S., Navarro, L., and Noor, M. A. 1995. *Strengthening National Agricultural Research Systems in Eastern and Central Africa: A Framework for Action*. World Bank Technical Paper No. 290. Washington, D. C., The World Bank.
- Weijenberg, J., Dione, J., Fusch-Carsch, M., Kere, A., and Lefort, J. 1993. *Revitalizing Agricultural Research in the Sahel: A Proposed Framework for Action*. World Bank Discussion Paper No. 211. Washington, D. C., The World Bank.