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**AUDIT OF  
INTERNATIONAL AGRICULTURAL  
RESEARCH CENTERS**

**AUDIT REPORT NO. 9-000-86-4**

**February 25, 1986**

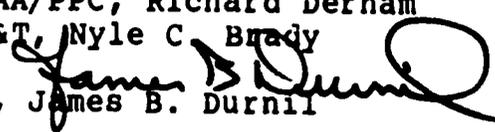
AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON, D.C. 20523

Office of the  
Assistant Inspector General  
for Audit

February 25, 1986

MEMORANDUM FOR SAA/PPC, Richard Derham  
SAA/S&T, Nyle C. Brady

FROM: AIG/A, James B. Durnii 

SUBJECT: Audit of International Agricultural Research  
Centers Project

This report is based on the audit of International Agricultural Research Centers. The audit objective was to determine if results of selected research centers were actually being used.

While the Centers were developing new technologies, farmers were not using these technologies widely enough to have had a measurable impact, except for wheat and rice crops.

This condition existed for a number of reasons but primarily because of 1) constraints to technology transfer within the countries, 2) inadequate integration of the Centers into AID programs, and 3) lack of AID oversight of publications on Centers' research. Also, AID had not formally analyzed and considered Center performance and impact in determining funding levels.

The six audit recommendations are directed at (1) overcoming impediments to technology transfer, (2) integrating the Centers into AID agricultural programs, (3) improving the effectiveness and dissemination of the Centers' publications, and (4) requiring better evaluation of Centers' performance in funding decisions.

The comments provided by your office generally concurred with the intent of the audit recommendations and indicated that corrective actions were or would be taken. Your transmittal memorandum, the introduction section to the detailed comments and the specific comments on recommendations summarized salient issues and are discussed after each finding along with Office of Inspector General response. The transmittal memorandum, the introduction section, and comments on recommendations are included as an appendix to this report.

Please advise me within 30 days of the actions taken or planned to close the report's recommendations addressed to your Bureau. Thank you for the courtesies extended to my staff during the audit.

## EXECUTIVE SUMMARY

Since 1967, AID has invested about \$350 million in twelve International Agricultural Research Centers (IARC). AID contributed \$45 million to these Centers in fiscal year 1985. This represented a \$20 million annual increase over the past 6 years. These Centers are charged with developing new technologies to assist the small farmer in less developed countries to increase agricultural production. The Centers' research mandate covers most food crops.

Shortly after the Centers were formed, new varieties of wheat and rice were developed and adapted by Asian countries and a critical food crisis was abated. However, subsequent to these initial successes and significant AID funding, no new breakthroughs of similar proportions have been made.

According to an impact study conducted on the Centers, the world's poor would have been worse off without the development of wheat and rice varieties. However, most other innovations related to these Centers' work have not yet been adapted widely enough to have measurable impacts.

While the IARCs were developing new technologies, the audit showed their actual benefits were not known since the technologies were not being widely used by farmers. The only exceptions were wheat and possibly rice. The main reasons for farmers not using IARC technologies were:

- national agricultural research organizations were not capable of adapting IARC technologies to local conditions
- the means to extend technology to the farmer often did not exist
- countries lacked adequate seed production capability, fertilizer, and storage facilities, and
- policies on crop prices and other inputs were unfavorable to the farmer.

A study done for the Bureau for Policy and Program Coordination considered the results of 75 AID project evaluations and 22 Inspector General audit reports on agricultural development projects. This study concluded that new technologies were not benefitting the small

farmer. Generally, small farmers did not have access to the new technologies, but even farmers, who did have access, were often not adopting the technologies.

AID could better protect its very substantial investment in international agricultural research by ensuring that AID projects incorporate this research into related activities. For example, AID should require missions to consider IARC results when formulating a project. Also AID needs to foster direct links between IARCs and national programs to better protect AID's investment in the Centers. AID should also explore ways to bridge the gap between national agricultural researchers and the farmers, such as encouraging projects which directly link these groups.

AID needs to more effectively manage the publications of the Centers. Publications were an important means of disseminating research results, however, the publications were

- too technical for use by most AID Agricultural personnel;
- often not translated into Spanish and French; and
- not well distributed.

As a result, many of these documents remained unused and the benefit of AID's investment was significantly reduced, both in terms of the cost of the publications and the far more costly research which also remained unused. AID needs to review the method of disseminating research information to ensure that key personnel in AID missions and the country's national agricultural institution receive information they can read and understand and that is pertinent to their informational needs.

AID has continued funding of IARCs without the advantage of detailed analysis of the Centers' performance and contributions. Funding has increased to \$45 million annually and we found little evidence that crucial factors were considered in setting funding and allocation levels. In 1984, the project office identified 17 factors to be considered in funding decisions, however, these were merely a listing of possible points of consideration rather than a set of factors actually considered or evaluated. AID needs to establish guidelines for determining the funding for

each Center which include an analysis of the actual impact each has had on AID's specific objectives.

#### Management Comments

The Agency management provided lengthy comments on the draft report. Overall, the Agency believes that the audit understates the accomplishments of the Centers, particularly for wheat and rice, and the degree of AID missions knowledge of and interaction with the Centers. Furthermore, the obstacles to technology transfers, identified in the report, are outside the mandates and scope of the Centers, and their resolution requires a commitment from national governments and concerted efforts of all donors.

Agency management, however, generally concurred with the intent of audit recommendations. Management said that new procedures are being established to determine and administer funding for the Centers.

#### Office of Inspector General Comments

The successes in wheat and rice during the "Green Revolution" which began in 1960s are well known, but this report deals with more recent research results in other crops--maize, sorghum, pearl millet, cassava and cowpeas, as well as rice.

AID's investment in the Centers since 1967 now totals \$350 million. This large investment should have resulted in measurable benefits to the small farmers--however, our audit as well as the Centers own (1985) impact study found that this has not occurred.

Many of the obstacles to technology transfers are outside the Centers direct mandate, but should be better addressed by AID. Concerted efforts of AID, in coordination with other donors and the Centers, is needed, if AID's investment in the Centers is to achieve its potential benefits.

Prior to this audit, AID had not formally established an upper limit for its contributions to an individual Center. The draft report discussed the need for an upper limit and management responded that it had established a policy. The new policy states, ". . . AID funding to a given Center not exceed 35 percent of the Center's core budget except under unusual circumstances and for short periods of time." Since AID's contributions to individual Centers never exceeded 33 percent and only one Center received more than 30

percent of its core funds from AID, this section has been deleted from the report.

Management's new procedures for determining the funding for the Centers should provide AID with an in-depth view of annual performance and how the Centers are contributing towards AID's objectives.

Management comments were considered and used to modify the audit report where deemed appropriate. However, for the most part, the comments were not responsive to the issues developed in the report. The transmitting memorandum, the introduction section and the specific comments on the recommendations did cover substantive issues and accordingly they are included as an appendix to this report. Management comments and the Inspector General response follow each finding section.

*Office of the Inspector General*

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PART I - INTRODUCTION

A. Background

AID is authorized by the Foreign Assistance Act of 1961, as amended, to carry out agricultural research which is to assist the small farmer and to increase food production. The Act requires that the agricultural research (1) consider the special needs of small farmers in determining research priorities, (2) include research on the interrelationships among technology, institutions, and economic, social, environmental and cultural factors affecting small farmers, and (3) make extensive use of field testing to adapt basic research to local conditions.

The Act requires special emphasis be placed on *disseminating research results* to the farms on which these technologies can be put to use.

From 1967 to 1985, AID has invested about \$350 million in 13 International Agricultural Research Centers (IARCs) which are sponsored by the Consultative Group on International Agricultural Research (CGIAR). AID's contribution has increased from \$24.8 million in 1979 to \$45 million in 1985. (See Exhibit 1). These Centers are independent organizations and are supported by national governments, international agencies, and foundations.

AID support is provided directly to the CGIAR-sponsored IARC in the form of a general support grant to be used for operating and capital expenses. Overall policy and administration of the IARCs is the responsibility of the CGIAR. This group was organized in 1971 to bring together countries, public and private institutions, international and regional organizations, and representatives from developing countries to support a network of international agricultural research centers and programs.

Shortly after the IARCs were formed, new varieties of wheat and rice were developed and adopted by Asian countries and a critical food crisis was abated. This period has been referred to as the "Green Revolution.

Currently, CGIAR sponsors 13 centers throughout the world. These Centers are involved in research on all major food crops, livestock production and the various factors affecting farmers in the developing world.

Appendix I identifies each of the CGIAR sponsored centers, its research priority and location.

The crop production Centers' primary purpose is to generate new technology such as new crop varieties or farming practices for farmers. In theory, countries' national research programs would test the new varieties or methodologies developed, and if the tests were acceptable, adopt the technology and transfer it to the farmer. The means for actual on farm application would be through extension linkages in the national programs. Developing new technologies for developing countries takes between 6 to 14 years. Adaption of these technologies to local conditions takes between three to six additional years. The total time frame for development of a new variety to release to the small farmer ranges between 9 to 20 years. The Centers covered in this review were all established prior to 1973 and have developed new crop varieties.

The transfer process from the IARC to the farmer is shown in the following chart.

FLOW OF RESEARCH TECHNOLOGY TO THE FARMER

Global  
IARC

- a. Explore problems
- b. Research results

Country X  
National Research  
Center

- a. Test IARC results
- b. Release technology to extension service

Country X  
Nat. Extension  
Service

- a. Demonstrate new technology
- b. Transfer technology to farmer

Country X  
Farmer

- 1. Acceptance of new technology
- 2. Improved Yield

## B. Audit Objectives and Scope

The purpose of the audit was to determine if research results developed by individual crop production centers and funded, in part by AID, were being used by small farmers in developing countries. The Office of the Regional Inspector General for Audit/Washington coordinated the review using an audit staff from the field offices located in Senegal, Honduras, Pakistan and the Philippines. The audit was conducted from November 1984 to June 1985.

To evaluate the impact International Agricultural Research Centers had on local farming conditions, the research activities of four international centers specifically researching major food crops were reviewed. The Centers and the crops were selected to provide worldwide coverage, namely, Africa, Asia, and Latin America. The Centers and specific crops reviewed were:

1. International Rice Research Institute (IRRI), Philippines--rice
2. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India--pearl millet, sorghum
3. International Maize and Wheat Improvement Center (CIMMYT), Mexico--maize (corn)
4. International Institute of Tropical Agriculture (IITA), Nigeria--cowpeas, cassava

The four Centers in total received about 54 percent of the total AID contribution provided to international agricultural centers.

In addition to visiting the IARCs, we met with officials at all levels involved with national research institutions, extension organizations and experimental stations located in Liberia, Senegal, Cameroon, India, Indonesia, Honduras, Ecuador, Philippines and Pakistan. In these countries, when practical, small farmers were interviewed to identify the benefits they received from the new technology.

In each of the countries, discussions were held with government agricultural officials, cognizant officials from the various research and extension institutions, and AID mission agricultural officers. Also, regional research directors from Haiti and Panama were interviewed.

The extent AID/Washington monitors research efforts of IARCs and ensures that research efforts are consistent with AID priorities was reviewed. Responsibility for the program is with the Bureau of Science and Technology and the Bureau for Program and Policy Coordination. We discussed the program with cognizant officers and also met with officials from the World Bank and the CGIAR.

The audit was made in accordance with generally accepted Government audit standards.

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PART II - RESULTS OF AUDIT

While the International Agricultural Research Centers (IARCs) were developing new technologies, most farmers were not using them. Many factors contributed to this condition, but the primary causes included: inability of national agricultural research and extension institutions to transfer technology, unfavorable host government agricultural policies towards farmers and lack of other supporting services. These situations needed more attention if AID's \$350 million investment in the Centers was to be worthwhile.

AID had not formally established policies and procedures to integrate the Centers into AID's programs and projects. The publications produced by the Centers were not receiving the necessary attention to assure that these were directed to the widest possible audience and in useful languages. Furthermore, AID had not formally analyzed the performance and the impact of each Center in determining AID's annual contribution.

The six audit recommendations are directed at integrating the Centers into AID agricultural programs and projects, improving the effectiveness of the Centers' publications and requiring better evaluation of Centers' performance in funding decisions.

A. Findings and Recommendations

1. Use of International Agricultural Research by Farmers

AID policy and sector guidance on food and agricultural development requires that research results be transferred to the small farmer. In the mid-1960s and early 1970s two IARCs developed new varieties of rice and wheat that were widely accepted and used in Asian countries. However, with the exception of these two food crops, research transfer and utilization has been limited. Crop production--one measure of research impact--had not increased in most countries reviewed. Farmers were not utilizing more recent IARC results for many reasons including:

-- the means to adapt and disseminate research was often inadequate,

- seed production capability, fertilizer, and storage facilities were often inadequate, and
- government policies on crop prices and other inputs needed by the farmer were unfavorable.

India, Pakistan, the Philippines, and Indonesia had adopted IARC rice varieties and India and Pakistan had adopted wheat varieties. Factors limiting adoption were less present in these less developed countries and were mitigated by a strong commitment on the part of the national governments.

IARC research results were not fully integrated into AID's agriculture development projects. While AID expects IARCs to generate adaptable technologies, it does not require its Missions to consider IARC's research results in their development projects. Also, AID had not adequately fostered programs which directly link national agricultural researchers and farmers in a manner to facilitate the delivery of new technologies.

Agency officials believe that the IARCs are developing new varieties of crops capable of increasing the food supply in developing countries. These officials point to the development of wheat and rice varieties as examples of these conditions. The officials state that more time is needed for other crops to have an impact.

In the countries reviewed, these other crop developments had not had wide acceptance and only limited impact. The Consultative Group on International Agricultural Research (CGIAR) impact study confirmed that, overall, the only measurable impact for the Centers has been in wheat and rice. AID needs to be more active in ensuring other new crop varieties are tested for local conditions and distributed to farmers for widespread use. In the absence of widespread use of IARC research results, AID's continued funding of the Centers will not have the desired results.

#### Recommendation No. 1

We recommend that the Bureau for Program and Policy Coordination revise the AID Agricultural Sector Guidance to require integration of International Agricultural Research Centers' results into relevant agricultural research and crop production projects and programs.

#### Recommendation No. 2

We recommend that the Bureau for Program and Policy Coordination require that Project Papers for bilateral

agricultural research or crop production projects contain a specific and detailed description on how national agricultural research organizations will coordinate and cooperate with the appropriate International Agricultural Research Centers in the project.

### Recommendation No. 3

We recommend that the Bureau for Science and Technology in coordination with the geographic bureaus:

- a. advise Missions of the importance of creating direct linkages between national agricultural researchers and farmers to overcome technology transfer constraints; and
- b. provide the Missions with the lessons learned from recent evaluations on the effectiveness of direct linkages between researchers and farmers in the transfer of technology.

### Discussion

Increased crop production is one accepted measure for evaluating the impact of agricultural research. New wheat and rice varieties developed by two Centers had been widely accepted and used by farmers in a few less developed countries and had significantly increased production of these two crops.

In the nine countries reviewed, however, only Indonesia and Ecuador had significantly increased crop production in the last five years and these increases were limited to rice and maize crops. In both cases, new IARC varieties were used to achieve these increases. In both India and the Philippines, IARC varieties had been used during the same period, but their production of pearl millet and rice, respectively, had not increased. India's production of millet had become stable and the Philippines production of rice had declined.

In the remaining five countries reviewed, crop production had, in general, not improved. In Senegal, production and the area planted for millet, sorghum, and cowpeas had declined significantly between 1980 to 1984. In Pakistan, millet production for the period 1979 through 1984 had fluctuated between 214,000 metric tons to 277,000 metric tons, but the highest production was recorded in 1979. Reliable crop production statistics were not available for Honduras and Cameroon, but officials stated that production had not improved in the past five years.

Further evidence that farmers were not benefitting from new technologies developed was described in other evaluative studies. The first was a consultant's report covering AID internal project evaluations and Inspector General (IG) audit reports issued in fiscal year 1984. The consultant's report was contracted for the Bureau for Policy and Program Coordination to identify lessons learned from AID evaluations and audits.

The consultant reviewed 75 project evaluations and 22 IG reports on agricultural development projects. The consultant concluded that there was substantial evidence that poor small farmers--AID's principal target group--were generally not receiving relevant new technologies. Even when the farmers had access, they did not adopt the new technology.

The consultant concluded that technologies were available but many countries did not have an adequate delivery system. There was not a clear consensus as to why farmers with access to the technologies did not adopt them. The report discusses a wide range of technology transfer issues, some of which were also found during our audit and discussed in this report.

The second study was the 1985 CGIAR review. This report concluded that the world's poor would have been worse off without the IARC wheat and rice varieties initially developed in the late 1960s. These varieties made possible increased crop intensity, raised labor demand and lowered grain prices. However, the study reports that most other innovations related to the Centers' work have not yet been adopted widely enough to have had measurable impacts.

The CGIAR study stated that new varieties provide farmers with more options. These new varieties are more responsive to fertilizers than traditional varieties making investments in fertilizers profitable; yet, these varieties produce better than traditional varieties even without fertilizer.

The CGIAR study also reported that many of the poorest people are in difficult environments, such as semi-arid zones or in rice growing regions without reliable rainfall, and the farmers continue to grow traditional varieties. The new varieties developed so far have offered insignificant advantage for such conditions. Significant change in these areas is likely to occur only when better varieties of drought tolerant crops of millet or sorghum become available or when techniques that raise water use efficiency can be used to support the new varieties.

Integration of IARC into Projects - The May 1982 policy on Food and Agricultural Development required AID to support the identification, transfer and adaptation of existing technologies as well as to carry out new research to improve agricultural production in developing countries. This policy also required AID's continued support of IARC efforts towards developing these technologies and called for close coordination to ensure dissemination of research to small farmers.

AID's 1983 agriculture sector strategy calls for developing strong host country institutional capacities needed to deliver technology to farmers. Part of the strategy called for research to be linked with farmer advisory services in a two-way flow of information.

Technology developed was to have considered distribution, credit availability, market access, policy support and potential impact on the people. The strategy also called for AID to support linkages between IARC's and national programs.

In June 1985, the Administrator, AID, said in a world-wide cable that results of technology transfer in the agricultural area had been disappointing. He stated that the adoption of U.S. style extension systems are not necessarily appropriate for developing countries. He encouraged innovative approaches to agricultural technology transfer and the inclusion of the private sector in wherever possible.

In the nine countries reviewed, only limited coordination between IARC's and AID agricultural development activities existed. Only when an IARC was involved in actual project implementation and funded by a mission was there significant involvement.

Four of the countries reviewed had formal commitments to work collaboratively with more than two CGIAR sponsored IARCs, and five countries had no formal commitments with any IARC. For example, India and the Philippines had formal commitments to collaborate with the International Rice Research Institute (IRRI), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the International Maize and Wheat Improvement Center (CIMMYT), but Cameroon and Senegal did not have such a commitment with even International Institute of Tropical Agriculture (IITA), which is located in West Africa. While these countries can and do receive materials from IARCs, the lack of collaborative agreements indicates the limited involvement of IARCs in local research.

These conditions also existed because AID had not integrated IARCs into its development projects. According to AID/Washington officials, each mission determines the scope for agricultural projects. Although AID has contributed over \$350 million to IARCs, missions are not required to consider the Centers' research results in planning their projects. Consequently, IARCs were not being adequately utilized as sources for agriculture knowledge and the technology transfer process was generally not working.

The need to integrate IARCs' resources into AID programs is highlighted in the Africa Bureau Plan for Supporting Agricultural Research and Facilities of Agriculture in Africa. This plan calls for integration of AID's various agricultural research activities. The plan recommends that AID expand the capacity of IARCs to support national program development through special projects, particularly those which could involve a regional research network.

In an effort to improve the flow of research information from IARCs, AID assigned an agricultural liaison officer to IITA. It was anticipated that this officer would inform national and regional research extension institutions, as well as AID field missions, about the research capabilities and results of IITA research. It was also anticipated that this assignment would facilitate the transfer of research information and provide a more immediate benefit to the small farmer. The liaison officer was assigned to IITA in August 1984.

During the following six months, the liaison officer did not prepare any reports on his actions at IITA and, more importantly, he had not visited any AID Missions in Africa. According to Africa Bureau officials, the liaison officer's activities were constrained because of administrative problems but he had begun travelling to Missions and assisted them to obtain the cooperation of IITA.

The assignment of an agricultural liaison official to IITA was a positive step and may facilitate the transfer of research technology. However, AID missions must be made aware of the liaison officer's role, responsibilities and the mechanisms for interaction.

IARC Research Is Not Passing Through National Agricultural Programs To The Farmer - The ultimate test of agricultural research is whether or not it is actually used by farmers. In the nine countries reviewed, very little recent IARC research results were

actually being used by the farmer. Whether this situation existed because the results of research were not applicable to farmer needs was not pursued.

However, significant constraints to the effective transfer of technology to the farmer were identified. These constraints included:

- Adequacy of national agricultural research organizations and their capabilities to test new technologies,
- Adequacy or capability of national/regional extension services to deliver technology to the farmer,
- Availability of seeds, fertilizer and other inputs relating to the new crops, and
- Restrictive government policies which were disincentives to adoption of new technologies.

National Agricultural Research Programs Weak and Not Adapting IARC Results - The flow of agricultural research from IARCs through national research programs is an essential element in the successful transfer of IARC technology. National research programs are needed to determine if the materials developed by IARCs could be used locally.

Of the nine countries included in the review, only Ecuador, India and Indonesia had a national organization capable of testing adoption of IARC research results. These countries were able to perform tests on maize, pearl millet and rice, respectively.

Cameroon, Honduras, Liberia, Pakistan, Philippines and Senegal had various problems which limited their ability to test and adopt IARC research results. Below are examples of inadequate national research programs.

Cameroon - Agricultural research is the responsibility of the Cameroon Institute of Agricultural Research which is a national institution. Research was conducted at three experimental stations. These stations were still in the initial testing phase for IARC varieties and none of the varieties being tested had been released.

Liberia - Liberia did not have an adequate national agricultural research program and was not able to test or adapt existing technology. This was largely due to severe funding restrictions which resulted in a shortage

of research personnel and physical facilities including a lack of security on field research plots, inadequate library, laboratory, and chemical storage facilities. Also, the research institute had no seed storage capability; an office file cabinet was being used for this purpose and all the seeds were infested and unusable for tests.

Honduras - Honduras does not have national agricultural research institution or coordinating body. Research activities are limited to private companies.

For a 1984 project, the Honduran government and AID determined that the inadequate research system precluded any possibility of increasing food production. Budgetary restrictions had led to reduced staffing and low salaries for researchers. Accordingly, it was difficult to maintain good staff or to form effective linkages between national research and extension services, much less international research centers.

Because of the decentralized nature of the Honduran research program, the extent the government tested CIMMYT maize varieties could not be ascertained. Honduran research program officials stated that eight CIMMYT varieties were in use, but since 1981, no new CIMMYT varieties had been released.

A mission agricultural officer said that regardless of what had been released, maize yield has increased only marginally, if at all. In the region visited, several CIMMYT maize varieties had been tested but none were acceptable. According to a regional research official, CIMMYT was working on an improved variety specifically for their area.

Pakistan - Most agricultural research in Pakistan is carried out in provincial research institutions and universities. The Pakistan Agricultural Research Council is responsible for coordinating and financing most of the agricultural research done in the country.

According to Government of Pakistan and USAID officials, Pakistan does not have adequate capability to conduct multi-disciplinary research on major agricultural crops at either the national or provincial level. Problems identified included the lack of (1) equipment and facilities; (2) qualified research scientists; (3) administrative support services, and (4) coordination between national and provincial research organizations.

Senegal - The government of Senegal had not released an IARC improved variety in the last ten years. Although government researchers have been working with several new crop varieties, the results are not encouraging. For example,

- the selection program on maize varieties has not led to any recommendations significant enough to warrant acceptance for farmers;
- in 1979, a cowpea research program was started with participation of several institutions. Varietal comparisons were made from 1979 to 1983. It was determined that no better varieties than those currently available in Senegal had been developed, and,
- improved rice varieties from West Africa Rice Development Association (WARDA) had generally not proven successful in Senegal, and only one variety had shown any potential at all.

A senior Senegal Government official in charge of research stated that they do not consider research being performed at IARCs in establishing priorities for their national research program. Research projects are based on proposals made by researchers to a National Commission. This official was unable to identify any specific research project initiated as a result of IARC research activity.

National Extension Programs Further Constrains the Transfer of IARC Research Results - Extension services are a link from the national research programs to the farmers. These services can provide a communication channel--bringing research information to the farmer in a form he understands, and advising researchers of the farmers needs. Those countries, which had weak national agricultural research programs, also had weak extension programs compounding the problem of IARC research results being adopted by farmers.

In a June 1985 world-wide message, the AID Administrator advised that the agricultural technology development and transfer process is not complete until the farmer adopts and profits from the research results.

In the countries reviewed,

- Extension services were poorly linked to national agricultural research institutions.

- Extension workers were expected to service an excessive number of farmers.
- Many farmers were difficult to reach; transportation and communication networks were primitive or non-existent, and there were shortages of vehicles and fuel.
- Extension workers' time was used for administrative rather than production-oriented work.
- Extension workers often worked only part time.
- Funds were not available for per diem, supplies for demonstration plots, and other necessary outlays.

National agricultural researchers generally did not communicate directly with farmers, which is one method to facilitate the transfer of new technologies. In India, however, the national research organization had established a lab-to-land program where 200,000 farmer families were targeted to work directly with 200 scientists on the latest proven and viable agricultural technologies. The Egyptian Government had also initiated a program for agricultural researchers to work directly with a selected group of farmers.

The following summaries discuss the extension capabilities of countries visited and problems related to transfer of IARC research to the farmers:

Cameroon - Extension services in Cameroon were not effective. Extension is fragmented between a national extension service and 12 parastatal extension service agencies.

In 1982, AID, the World Bank and the Food and Agricultural Organization evaluated the Cameroon extension services and found that (i) small farmers were not being reached, (ii) extension services concentrated on export crops at the expense of food crops, (iii) extension agents were not trained and (iv) agents could not contact small farmers since they had no transportation or travel allowance.

At the time of the audit, these conditions, although well known, still remained.

Liberia - In Liberia, there is virtually no interface between the national research institution and

experimental stations, and the farmers for the transfer of technology and information. Although extension is under the Ministry of Agriculture, extension activities are spread among special development projects and the ministry.

The Liberian Ministry of Agriculture and USAID officials stated that due to extensive program weaknesses relatively few farmers had been reached or affected by extension activities.

Honduras - According to an AID project paper for the the establishment of an agricultural research foundation, the extension program in Honduras is inadequate and cannot provide effective extension services to farmers.

We were unable to trace any IARC improved technologies to the extension services. While some maize research had been conducted in the region visited, the extension agents had no new technologies to transfer to the farmers.

Ecuador - Ecuador does not have a formal extension service. Information is transferred indirectly by a number of agricultural organizations.

Maize production had increased in Ecuador, however, this occurred more because the government established favorable credit and price support programs, than adoption of new technology. For example, in 1979 the national development bank made \$10.7 million in credit available to finance planting 60,000 hectares of maize. A marketing agency was funded to support production with the purchase of 20,000 tons at the official support price of \$179 per ton. Support prices were subsequently raised for the farmers in 1980 and 1981.

This situation, although somewhat isolated, indicates that opportunities exist for increasing crop production through the use of preexisting technology, by adjusting price supports and increasing farm credit.

With no formal extension system, farmer preferences were not known or considered. Two farmers were contacted who were planting a new maize variety. They said that government officials had visited them and asked them to plant this variety. They planted the variety, but were not asked for their viewpoints.

Senegal - The Senegalese extension service has never had the opportunity to transfer an IARC improved seed variety to the farmer because no new seed varieties have

been released. Should the opportunity become available, it is doubtful whether the transfer could take place because of broad changes in government policy.

For example, in 1984, the Government of Senegal reappraised the role of its rural development agencies. As a result, one of the agencies responsible for extension of cowpea, maize, and millet lost about 75 percent of its personnel.

A recent AID study found that the Senegalese extension program was not effective because of a lack of qualified staff and a reluctance of extension staff to collaborate with national research staff.

India - Although most countries' extension services were weak, India has established processes to transfer new technology. In fact, ICRISAT technology had been distributed to Indian farmers through the extension services and two ICRISAT pearl millet varieties were being used by farmers of one Indian state.

Further Constraints on Adopting IARC Results - Even if adaptable research was available to farmers, its impact would be lessened because of other agricultural constraints. These constraints included lack of seed and fertilizer, lack of markets for increased production, lack of agricultural credit and poor pricing policies. These constraints must be resolved if research is to have the intended impact. The following cases describe one or more of these constraints. Both AID and the countries have been aware of these problems, but efforts to correct them have not been successful.

Cameroon - Cameroon lacks adequate seed multiplication capability. Cameroon had no seed certification program and had conducted limited seed testing. Adequate facilities were lacking for seed processing. These deficiencies were constraining the adoption of improved varieties developed by IARCs.

Also, the government agriculture policies had favored export crops versus food crops. For example an AID/Cameroon study reported that of 180,000 tons of fertilizer available for the 1985-1986 cropping season, about 95 percent would be used for the production of export crops; yet food crops represented over 70 percent of the land in agricultural production in Cameroon. Cameroon subsidized the use of fertilizer for export crops but not for food crops. As a result, fertilizer for food crops cost twice as much as for export crops. Pesticides were available for export crops only.

Senegal - Seed multiplication facilities for cowpeas, maize, millet and rice were not adequate in Senegal. As a result, Senegal imported seeds. In early 1984, one of the parastatal agencies was faced with a demand of 70 tons of maize seed from its farmers. The only source the agency could find was Mali, which could provide only 25 tons.

In 1985, Senegal imported 650 tons or 52 percent of its needs for cowpea seeds. Because the shortage was critical, Senegal had to import a "black eye 5" variety from California which had had limited testing and yielded less than local varieties.

Also during the last 5 to 10 years, IARC research did not produce a cowpea, millet or rice variety capable of being transferred to the Senegalese farmer. However, a new maize variety, originated by IITA may be ready for transfer. But transfer has not been possible because (i) the seed had not been approved by the Senegal National Seed Board, (ii) technical data sheets had not been prepared, and (iii) seed multiplication facilities were not available.

Senegalese farmers do not have adequate access to fertilizer or other inputs. The Government is unable to finance fertilizer subsidies and there is no public or private system with the capability to distribute the fertilizer. Access to fertilizer and other inputs is also severely constrained by lack of farm credit. The Government terminated farm credit in 1979 due to a bad harvest season and the lack of credit repayment by the farmers.

Liberia - In one locality in Liberia, agricultural researchers tried to increase rice production. Utilizing an improved variety, initially developed by IITA, a new program was initiated. The program did not succeed because the farmers, who had planted the new variety, still had a huge rice stock left over from the prior year's harvest which they could not sell.

Philippines - The Philippines has gone from an exporter to an importer of rice in recent years. In 1984, the Philippines imported about 100,000 metric tons of rice. The Philippine farmers used improved IRRI varieties, but were not able to obtain fertilizer at a reasonable price.

According to IRRI officials, the recent change in government policies on fertilizer and rice prices had caused farmers not to purchase fertilizer, which was essential to obtain the high yields possible with IRRI

varieties. The government policy was not to import fertilizer but to create indigenous sources. However, the cost of local fertilizer was greater than farmers could afford to buy at the recommended application rates.

Furthermore, the government controlled the wholesale price of rice at levels less than farmer's total cost for production. This factor also contributed to the declining production. Accordingly, without strong government support, even improved high yielding IARC varieties may not raise the farmers income or result in increased food supply.

### Conclusion

AID may not be able to address all the factors limiting the transfer of IARC research results to the farmer. However, AID could do more to integrate the IARC efforts directly into AID projects. Unless AID fosters direct links between IARCs and national agricultural research programs through the bilateral projects, the transfer of technology is left to chance rather than a coordinated and planned effort.

AID could also evaluate agricultural programs which directly link national agricultural researchers with farmers as one means to effectively transfer new technologies. Without these actions, the effectiveness of AID's \$350 million investment in the Centers and the \$45 million annual contribution is substantially reduced and the benefits of the research may not be realized.

### Management Comments

Agency management stated that the audit report identified a number of important constraints affecting agricultural research and development programs. Management further stated that these constraints are known and do not necessarily reflect inadequacies in scientific research and outreach activities of the Centers.

### Office of Inspector General Comments

The identified constraints must be solved through proactive action by AID and the integration of the Centers into AID programs. While these constraints are not the result of inadequate research or other activities of the Centers, without a direct flow of information between the farmer and the researcher, the risk of inappropriate research exists. The 1985 CGIAR

study on the impact of the Centers reports that "There has been considerable discussion within national systems and the donor community of the adequacy of links between national research systems, extension systems and farmers. Linkage deficiencies slow the flow of technology to farmers, lend to inappropriate research because researchers are not conversant with farmers' problems, . . ., and result in returns [on investment] to research and extension lower than they might be."

The Centers have provided new technologies which may have the potential to benefit farmers. However, this potential has not been achieved, because of constraints identified in this report.

#### Management Comments

Technologies are being used. Despite the problems outlined in the report, many technologies generated by the Centers are being adapted and used by farmers. The classic example of this is the "Green Revolution" in rices and wheats. The audit report asserts that new technologies are not being used or benefitting the farmer. The wheat and rice developments would clearly dispute this finding.

#### Office of Inspector General Comments

The gains in food production through research during the "Green Revolution" are well known. However, newer technologies developed for crops, other than wheat and rice, have not had the same degree of acceptance and have not benefited farmers to the extent possible. As discussed on pages 9 and 10 of this report, the 1985 CGIAR study on the impact of the centers reached conclusions similar to the results of our review. Consequently, we concluded that the technologies are not being used to the extent practicable and AID should take additional steps to improve the distribution of research benefits.

#### Management Comments

A long term perspective in evaluating research is needed. AID can be proud of its long record of strong support for the research in cereal grain crops--wheat and rice. However, that research started prior to AID's direct support. The time scale for research efforts are long (6 to 14 years) and requires stable support. Results generated by the Centers show a potential for large and continuing impact on food production.

### Office of Inspector General Comments

AID's long term commitment and support for agricultural research is not questioned in our audit. Development of new technology can take between 6 to 14 years and local testing and adoption takes additional time. The countries reviewed had generally not adopted the new technologies developed by the Centers and several were not even testing new varieties. The causes for this condition were not necessarily related to the potential usefulness of the Centers' research, but to the conditions in the country as described in our report.

The result, however, is the same--the technology is not being used by the small farmer. AID needs to do more towards reducing the impediments to technology transfer, if its investment in the Centers is to reach its potential benefit.

### Management Comments

Efforts are being made to strengthen national research programs. The Centers have developed training programs and educational activities to help strengthen national programs. The Centers recognize that the conditions in the national programs are obstacles to testing and adoption of new technologies. As an additional approach, two specialized centers were created, one to deal with problems of national research and extension systems and one to cover food and agricultural policies. Both are small institutions but they reflect AID concerns which complement agricultural research conducted by other centers.

### Office of Inspector General Comments

While we did not specifically review these areas, they were considered in preparing the report. The Centers reviewed were generally aware of the conditions of the national programs they dealt with. The two new Centers--the International Service for National Research and the International Food Policy Research Institute--are charged with working on national program problems and policy issues and are just beginning to work with national programs. However, these activities do not reduce AID's responsibility to integrate the Centers' resources and results into its own programs.

### Management Comments

The CGIAR is a comprehensive and analytical system. The CGIAR system provides for a considerable amount of

planning, review and evaluation. The group has recently completed an extensive and detailed impact study and is completing a budget and finance study. AID is more involved in the CGIAR mechanism than any other donor, which is reflected in the size of its contribution, the degree AID staff is involved in deliberations and decision making, and its extensive contracts in the research community.

#### Office of Inspector General Comments

The internal management of the CGIAR system and AID participation in the decisions of the system were not areas considered in this review. The system is not wholly financed by AID, therefore, we did not review the management of the system. The degree of AID participation in the system seems adequate considering the size of AID's contribution and its project requirements.

#### Management Comments

AID internal management is being formalized and broadened. Some of the managerial concerns addressed in the report are being addressed. A mechanism for determining funding levels is being established and considerably more documentation on the process will be produced.

#### Office of Inspector General Comments

These actions should provide management a better view of the Centers' annual performance and their contributions toward AID objectives.

#### Management Comments

Agency management generally agreed with the intent of the recommendations. However, management stated, that to a large degree, current activities and project planning review processes incorporate the intent of these recommendations. Management offered alternative wording for the first two recommendations. On the third recommendation, management stated that various studies are underway concerning improvements in extension technology transfer and questioned the need for additional study at this time.

#### Office of Inspector General Comments

The first two recommendations provide a discipline which does not exist in Agency guidance and regulations

concerning planning agricultural projects. The lessons learned from the studies referred by management need to be communicated to Missions for inclusion into current or planned projects.

## 2. Publications and Language Used

Publications are an important method of disseminating results of International Agricultural Research Centers' (IARCs) efforts. Each year the IARCs publish hundreds of documents on their activities and distribute these to AID, as required by grant agreements. These publications, however, were rarely used by AID Mission personnel and not necessarily useful to officials who are responsible for implementing improvements in agriculture. IARC publications were generally (1) too technical, (2) not printed in Spanish or French, and (3) not well distributed. This occurred because AID had not identified the best use of these documents and the typical background of the individual who is in the best position to apply the reported results. As a result, many of these documents are unused and the benefits of AID's funding of the IARCs has been reduced.

### Recommendation No. 4

We recommend that the Bureau for Science and Technology ask the International Agricultural Research Centers to write their publications for a broader audience than scientists and in less technical terms. Also, the Bureau should ask the Centers to translate important publications in French and Spanish.

### Recommendation No. 5

We recommend that the Bureau for Science and Technology determine its requirements for distributing International Agricultural Research Centers' materials and determine which AID offices should receive the Centers' materials and to what extent.

### Discussion

In 1984, the International Rice Research Institute (IRRI) produced a bibliography on publications on international agricultural research and development. The lead paragraph in the forward read,

"Knowledge gained through international agricultural research is useless unless it is published and disseminated to its target audience of scientists, educators, extension specialists and farmers." (underscoring added).

In contrast, IARC officials stated that most publications were intended for scientists in other countries. This position was based on the premise that

scientists would review the IARC publications and be convinced that the research was scientifically valid.

The publications are directed at scientists, according to AID officials, to allow the scientists to narrow the range of conditions or materials that must be tested locally.

Most AID personnel, who received and who were expected to use these publications, were not scientists. Those interviewed said that they found the IARC material to be too technical to use. In fact, nearly all of the AID agricultural officers contacted said that they do not read these reports and usually send them to a library at the mission or host country.

However, very few of the IARC publications distributed annually were maintained at the AID mission libraries and offices. For example, at the mission in India, Indonesia and the Philippines, the libraries and offices did not have current publications from the 13 IARCs. With these IARCs sending materials to the AID missions, this is a further indication these materials were not useful to the recipients.

In Senegal, the AID agricultural officer filed all IARC reports in his office. However, he pointed out that these reports were too technical to use and not necessarily germane to his program. He said the reports were intended for scientists and not to mission agriculturists.

In Liberia, the AID agriculture officer said he received the IARC reports. Occasionally he had time to read these, but, generally these documents were referred directly to the host government. He said that he lacked the time to study the reports in the chance of identifying something useful to Liberian agriculture. He assumed that the Central Agriculture Research Institute (an AID funded project) received such reports and used them. We visited the Institute and found that often the IARC reports were not received and those in the library had not been used for some time and most had not even been cataloged.

The majority of documents published by the IARCs were in the English language in keeping with IARC's policies. IARC officials stated that translating their reports to Spanish or French was very costly, and accordingly had done very little in this regard.

The International Institute of Tropical Agriculture (IITA) is located in Africa and serves French speaking West Africa. According to a 1984 bibliography on IITA publications spanning 1975 through 1983, it published 77 documents. These included annual reports, monographs, conferences, bibliographies, periodicals and miscellaneous papers. All were published in the English language, but only 18 were also published in French and only one in Spanish. In one large West African country -- Senegal -- the national researchers told us that few of their personnel could read English, thus most of the IITA documents were not usable.

Distributing Useful Information - Prior to 1982, the Bureau of Science and Technology received and distributed only selected IARC publications. Subsequently, the Bureau modified grant agreements to require major publications be sent to AID/Washington and AID Missions. An office in the Bureau of Science and Technology was charged with the distribution of IARC materials. Generally, the AID Missions visited received some, but not all IARC publications.

In 1984, AID/Washington received nearly 300 publications from 12 IARCs in the CGIAR group. Also, AID missions and other overseas offices were to receive many of these publications. This wide distribution was not necessary. Overseas offices with few or no agricultural staff cannot assimilate the wide array of technical information.

AID had sent each IARC a mailing list of AID agricultural development officers overseas. The IARCs were instructed to mail significant reports to each address. Of the 63 locations listed, eight locations did not have an agricultural development officer position; ten had one position and ten more had only two positions. It is unlikely that these 28 AID locations could make effective use of the large number of IARC publications received.

Since all 63 locations were not contacted, the number of IARC publications received was not known. However, the estimated cost of distributing these publications to the 28 locations with two or less agriculture development officers was about \$42,000.

The Bureau for Science and Technology should reevaluate the AID distribution of IARC publications. The Bureau should also advise the IARCs that many publications are too technical to be used by policy makers and non-scientists and help identify publications which

should be written in Spanish and French. These steps could improve the effectiveness in communicating research results.

#### Management Comments

Management stated that they agreed with the need for broader diffusion of Centers' findings. However, Management believed that the Centers' technical publications are generally appropriate for their principal clientele: national agricultural research programs. Management stated that other Center publications are designed for broader audiences and extension oriented materials must be the responsibility of national governments.

Management stated that the report does not give a "full picture" on the translation issue by not indicating the extent other Centers produce materials in languages other than English, Center's acquisition of computers to aid in translations, and English as the common language in agricultural research. Lastly, Management stated that the Centers are well aware of the translation issue and are in the best possible position to determine these needs.

#### Office of Inspector General Comments

The main issue raised in this audit is the adequacy of Centers' publications for the officials who should be using them. As stated in the report, the audience for Center publications is not restricted to scientists, but also includes educators, extension specialists and farmers. This list should also include officials responsible for budgets, programs and projects who are not scientists. None of these latter groups are able to make use of Center publications.

The highlight reports are produced for broader audiences and are generally fairly short. However, even these highlight reports can be lengthy. The 1983 highlight report from CIMMYT was 88 pages, ICRISAT's was 44 pages, IITA's was 122 pages, and IRRI's was 124 pages. Only ICRISAT and IITA published these reports in French and none of these reports were available in Spanish. Therefore even the value of highlight reports is questionable and even scientists have indicated a need to improve Centers publications. The 1985 impact study by the Consultative Group on International Agricultural Research (CGIAR) stated that scientists believed that the services of the Centers were not widely enough known, and more promotional information was needed.

The language issue is not new and needs to be better addressed. AID has missions and representatives in most developing countries and should use its presence in those countries to advise the Centers on the need for translation of their publications. AID should take a more proactive role in the publications of the Centers to better assure that those officials who can benefit from the Centers work receive the materials and receive it in a useful language.

#### Management Comments

Management agreed that it needs to review its requirements for distributing IARC materials. A new plan was recently developed which places distribution responsibility on the Centers.

#### IG Comments

The new plan may reduce the redundancy in the distribution of the Centers publications. We believe that AID must still review its requirements and determine who should receive Centers' publications.

### 3. Allocation of Funds

Allocation of funds to individual Centers was based on historical fund commitments rather than actual analysis of Center performance and its contribution toward AID objectives. In 1984, the project office identified 17 factors to be considered in allocating funds to each Center. However, there was little evidence that these factors were actually considered or that any systematic analysis was performed.

Funding has continued without adequate review and documentation of key factors, such as Center performance and impact on agriculture and food supply. As a result, AID funding to individual Centers was not based upon performance criteria or measurement of a Center's contribution to AID agricultural research objectives and priorities. Thus, AID management has no assurance that the best use of these funds were made.

#### Recommendation No. 6

We recommend that the Bureau for Policy and Program Coordination develop guidelines to use in establishing the annual contribution to each Center. These guidelines should include the extent of coordination with lesser developed countries, technology made available, and matching of AID agricultural research objectives and priorities.

#### Discussion

AID is the major contributor to the International Agricultural Research Centers (IARCs) sponsored by Consultative Group on International Agricultural Research (CGIAR). In 1983 and 1984, AID's contribution was two or three times greater than the largest other donor organization, i.e., the World Bank, or donor country. AID originally established a funding level of 25 percent for the IARCs. Since then, AID's contribution to an individual Center has grown to a high of 33 percent of the core budget. This does not include funds derived from special projects provided by individual AID Missions.

AID contributions to CGIAR sponsored IARCs has grown from \$24.8 million in 1979 to \$45 million in 1985. The increase was caused by adding two Centers to the Group and by increases in the size and scope of the other Centers' facilities and programs and inflationary trends.

Fund Allocation Process - Until 1983, the Bureau for Science and Technology had not made an effort to formalize

the process for determining the fund allocation for the Centers. Various draft documents relating to the process were developed in 1983/84 to explain the informal process used to allocate the \$45 million to 12 Centers.

Even after recognizing a need to formalize and document the process of allocating about \$45 million annually, the Bureau continued to allocate the funds on an informal and subjective basis. According to the last document on the process--Criteria for Allocation of Funding Among the International Agricultural Research Centers, August 30, 1984--there are a large number of factors which affect the AID funding decision. This document lists the following 17 factors which were to be considered:

1. Importance of a Center to Lesser Developed Countries--mandated research, and the current and potential importance to food production.
2. Geographic--some Centers conduct research on crops that are basic to food supplies in much of the world while others are regionally oriented.
3. Stage of Growth--the Centers' current developmental stage.
4. Production Potential or Target Areas--the set of conditions of relatively difficult production areas or relatively highly productive areas.
5. Population--important background factor to assure balance between Asia and other regions.
6. AID Concerns--agency agricultural research priorities and program priorities.
7. Program Quality and Performance--how well the Center is meeting its objectives.
8. Results of Reviews and Other Studies--consideration given to program and management reviews identifying strengths and weaknesses.
9. Regional Bureau and AID Mission Input--consideration of comments, reports and suggestions on all aspects of Centers' programs from AID organizations.
10. Field Demand for IARC Collaboration and Involvement--degree of special project activity for regional bureaus and AID missions.
11. Outreach Performance--degree centers have conducted efficient and effective outreach programs.

12. National Programs--degree of collaboration IARCs have with national research organizations and capability of national programs.
13. Historical Level of AID Support--represent the accumulated reasoning and priorities for center funding.
14. Impact--the degree to which a Center has succeeded in its mission.
15. Unique Nature of Center Programs--a unique role can be an additional reason for support, such as the only Center studying a problem.
16. Needs of the System as a Whole--AID is but one donor but its decisions can affect the entire system.
17. Other Factors and Special Considerations--consideration of events, such as political or economic difficulties or management changes, which need special consideration.

No records, reports, or analysis of any type were prepared to demonstrate how these 17 factors were used in arriving at fund allocations. The factors seemed to be more a listing prepared to satisfy an outside inquiry rather than a basis for allocating funds.

For example, the discussion paper for the fiscal year 1985 allocation of \$45 million stated that funding levels were based essentially on the 1984 levels which was \$45.25 million. It further stated that the \$250,000 reduction in funding for 1985 was apportioned among six larger and better funded Centers to reduce the negative impact of this cut. The paper continued with a generalized discussion of each of the 12 Centers but did not address any of the 17 factors which were ostensibly established as a basis for allocation of funds.

A similar paper on the 1984 allocations amounting to \$45.25 million stated that funding was to remain at the 1983 levels for six (6) Centers and the remaining six (6) Centers should receive an increase. In neither case was there a detailed analysis supporting these decisions. The reasons offered for the increase in funding as shown below clearly demonstrate the lack of detailed analysis:

1. IITA - a small increase (\$100,000) based on the critical need to increase food production in Africa.

2. IFPRI - AID funding has been relatively high (29.1%) but this increase (\$300,000) is needed to offset relatively low contributions by the Europeans. While generally pleased with their performance, we are concerned that their program is a bit too scattered and represents more the interest of researchers than the organization.
3. CIAT - The Center has had a relatively tight budget situation recently and has performed well (\$200,000 increase).
4. ICARDA - The Center is in the midst of its permanent building program and has done well. But it is a newer center, operating under difficult conditions. (\$300,000 increase).
5. ILCA - The Center has recently reorganized and made a number of improvements in operations. The increase (\$400,000) is principally justified on the basis of need and a brightened potential rather than past performance.
6. ICRISAT - AID's contribution has been traditionally low because of other donor contributions. It is an excellent center doing work of considerable importance. A modest increase (\$200,000) is to help finance expansion of effort in Africa and to raise the level commensurate with its importance.

*Nowhere in these documents was there an analysis of the actual impact these Centers has had on international agriculture in recent years.*

From 1979 to 1985, AID's contribution to individual Centers varied widely. The amount of AID support to individual Centers rose between 4.1 percent to 242.8 percent as shown in the following table.

AID Funding

<u>Center</u>	<u>1979</u>	<u>1985</u> (\$ in millions)	<u>Amount of</u> <u>Increase</u>	<u>\$</u>
IRRI	\$3.8	\$6.0	\$2.2	57.9
CIMMYT	3.6	6.0	2.4	66.7
IITA	3.9	6.2	2.3	59.0
CIAT	3.3	5.5	2.2	66.7
CIP	1.5	2.3	.8	53.3
ICRISAT	1.4	4.8	3.4	242.8
ILRAD	2.4	2.5	.1	4.1
ILCA	1.7	3.2	1.5	88.2
ICARDA	2.9	5.3	2.4	82.6
IBPGR	.5	.9	.4	80.0
IFPRI	.6	1.4	.8	133.3
ISNAR (1980)	.3	.9	.6	200.0
WARDA	0	0	0	0

The reasons for this wide variance in increase to individual Centers was not documented in the memoranda on AID contributions to the CGIAR system. According to the project officer, these increases represent growth in the core budgets of the Centers. The rapid increase in support to ICRISAT, the project officer explained, was based on growth in the Center's program, its expansion into Africa, and lessening of other donor support during this expansion.

Detailed analysis of the above variances in contributions to the Centers was not feasible because of the lack of documentation and detailed analysis of each year's contributions. While the funding levels were approved by Agency management, the lack of documentation and analysis does not assure management that the resulting increases were warranted or contributed to AID's agricultural research priorities.

A June 1985 special report on the CGIAR expresses similar concerns. The report stated that final judgments on allocation were not strictly quantitative, but were made on the basis of considerations that were weighted differently from Center to Center. The overriding concern, according to the report, was whether a Center had a distinct comparative advantage to conduct research on a certain topic or whether that area was better left to other research institutions or development agencies.

Although the special report identified evaluative factors to be used in the fund allocations, project officials stated that no analysis of the Centers' performance using these factors was made for the most recent allocation.

In contributing \$45 million annually to the CGIAR Centers, AID should have developed a systematic process to determine its contribution to individual centers. Without specific guidelines which justify the funding levels to each Center, AID's funding support levels for the Centers is arbitrary and open to misdirection.

The draft of this report discussed the need for AID to establish ceilings on its contribution to an individual center. In responding to the draft, management stated that AID funding to a given Center would not exceed 35 percent of the Center's core budget except under unusual circumstances and for short periods of time. Although this amount appears high since the Centers are supported by other countries, and donors and the World Bank, based upon management's positive action this discussion and the accompanying recommendation has been deleted from this final report.

#### Management Comments

Management stated that it is utilizing the 17 criteria listed in the report for determining the annual contribution to each Center. Management stated that the process for making allocations is becoming more formalized. Management believes that their new guidelines and procedures will satisfy the IG concerns and the audit recommendations.

#### Office of Inspector General Comments

A more formalized process is needed and should assist management to better determine the funding allocations to each Center. Management needs to review each Center's annual performance and determine how the Center is contributing towards AID's objectives. We will review these new guidelines and procedures on the allocation process, in closing Recommendation No. 6.

## B. Compliance and Internal Controls

### Compliance

Audit results show that, overall, there was an adequate level of compliance with applicable AID regulations and grant agreements. For example, each grantee is required to have a financial audit performed at least once every two years. We found that each grantee complied with this request by having an accounting firm perform the necessary audit as required. Nothing came to our attention that would show that grant items were not in compliance with applicable laws and regulations.

### Internal Controls

Overall, internal controls were found to be appropriate and were operating in a satisfactory manner except controls of fund allocation as discussed in this report. We were able to ascertain during the course of our review that grant agreements were consistent with the Financial Integrity Act. Grantor prepared the required documentation necessary to properly authorize, control and manage the numerous grants provided annually. Specific requirements were contained within the grant to require full reporting and accountability by the grantee.

AUDIT OF  
INTERNATIONAL AGRICULTURAL RESEARCH CENTERS

PROJECT NO. 936-4111

PART III - EXHIBITS AND APPENDICES

EXHIBIT 1

AID OBLIGATIONS TO IARCs SINCE  
INCEPTION THROUGH CY 1985

(\$000)

<u>CENTER</u>	<u>1969- 1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>TOTAL FUNDING ALL YEARS</u>
IRRI	\$14,505	\$3,600	\$3,850	\$4,300	\$5,900	\$6,300	\$6,000	\$5,940	\$50,395
CIMMYT	15,774	3,600	4,250	5,600	6,550	6,000	6,000	6,000	53,774
IITA	15,231	3,900	3,750	4,700	5,935	6,200	6,300	6,240	52,256
CIAT	11,355	3,300	4,350	4,900	5,400	5,600	5,600	5,540	49,095
CIP	5,615	1,500	1,700	2,200	2,200	2,300	2,300	2,300	20,115
ICRISAT	7,975	1,400	2,100	2,900	3,900	4,350	4,850	4,815	32,290
ILRAD	5,552	2,400	2,850	3,100	2,400	2,500	2,500	2,490	23,792
ILCA	5,140	1,700	2,250	2,400	2,550	2,800	3,200	3,175	23,215
ICARDA	3,130	2,900	3,050	3,250	3,650	5,000	5,300	5,300	31,580
IBPGR	940	500	750	800	850	900	900	900	6,540
IFPRI	-	-	550	800	950	1,100	1,400	1,400	6,200
ISNAR	-	-	250	600	1,000	900	900	900	4,550
WARDA	958	-	-	-	-	-	-	-	958
CGIAR REVIEW	-	-	-	100	-	-	-	-	100
<b>TOTAL</b>	<b><u>\$86,175</u></b>	<b><u>\$24,800</u></b>	<b><u>\$29,000</u></b>	<b><u>\$35,100</u></b>	<b><u>\$40,785</u></b>	<b><u>\$43,750</u></b>	<b><u>\$45,250</u></b>	<b><u>\$45,000</u></b>	<b><u>\$349,860</u></b>

LISTING OF  
INTERNATIONAL AGRICULTURAL RESEARCH CENTERS

CROP PRODUCTION RESEARCH

- o CIAT: Centro Internacional de Agricultura Tropical (International Centre for Tropical Agriculture, Cali, Colombia, is concerned with the production of the food staples of the tropics of the western hemisphere, particularly beans, cassava, rice, and beef.
- o CIMMYT: Centro Internacional de Mejoramiento de Maiz y Trigo (International Maize and Wheat Improvement Center), El Batan, Mexico, supports research around the world on maize and wheat as well as other major cereals such as barley and triticale.
- o CIP: Centro Internacional de la Papa (International Potato Center), Lima, Peru, aims to improve the solanum potato and to develop varieties suitable for growing in many parts of the developing world, where it has great potential.
- o ICARDA: International Center for Agricultural Research in the Dry Areas, Beirut, Lebanon, and Aleppo, Syria, concentrates on rainfed agriculture in semi-arid regions of North Africa and West Asia, with emphasis on durum wheat, barley, faba beans, and lentils.
- o ICRISAT: International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, India, is concerned with improving the quantity and reliability of food production in semi-arid regions of Africa, Asia, Latin America, and the Middle East, with emphasis on sorghum, pearl millet, groundnuts, chick-peas, and pigeon peas.
- o IITA: International Institute of Tropical Agriculture, Ibadan, Nigeria, concentrates on low-land tropical agriculture worldwide, with emphasis on roots and tubers, cereals, and grain legums, as well as the improvement of traditional farming systems.

- o IRRI: International Rice Research Institute, Los Banos, Philippines, the first of the international centers, continues to work on the improvement of tropical rice and rice-based cropping systems and related technologies.
- o WARDA: West Africa Rice Development Association, Monrovia, Liberia, aims to promote self-sufficiency in rice for a 15-country region where rice is a staple food and where there is great potential for increased production.

#### LIVESTOCK RESEARCH

- o ILCA: International Livestock Centre for Africa, Addis Ababa, Ethiopia, carries out research and development on improved livestock production and marketing systems for tropical Africa.
- o ILRAD: International Laboratory for Research on Animal Diseases, Nairobi, Kenya, seeks controls for two major livestock diseases, trypanosomiasis and theileriosis, that limit livestock production in huge areas of Africa, Asia, Latin America, and the Middle East.

#### PLANT GENETIC RESEARCH

- o IBPGR: International Board for Plant Genetic Resources, Rome, Italy, supports and promotes a network of international and national genetic resource centers to collect and preserve plant germplasm.

#### FOOD POLICY RESEARCH

- o IFPRI: International Food Policy Research Institute, Washington, D.C., USA, focuses on the sensitive economic and political issues surrounding food production, food distribution, and the international food trade.

#### SERVICE RESEARCH

- o ISNAR: International Service for National Agricultural Research, The Hague, Netherlands, the youngest of the centers, responds to requests from developing countries for assistance in strengthening their national agricultural research programs.

AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON, D.C.

1985 DEC 20 AM 11: 34

ASSISTANT ADMINISTRATOR

DEC 19 1985

MEMORANDUM

TO: RIG/A/W, B. Reginald Howard

FROM: S&T, N. C. Brady *NCS*

SUBJECT: Audit of the International Agricultural Research Centers

Attached is the Agency review of the draft report "Audit of the International Agricultural Research Centers". The response has been developed jointly by the Bureau for Science and Technology and the Bureau for Program and Policy Coordination (PPC) in consultation with the three Regional Bureaus.

The audit emphasized technology transfer and the associated problems of adoption of new methods and varieties at the farm level. We share this concern and concur with the importance of the impediments cited by the Audit. However we find that much has been accomplished despite the institutional obstacles, limited availability of inputs and underdeveloped infrastructure in many LDCs. Moreover, many of the issues related to such obstacles are outside the mandates and scope of the international centers: they require a commitment from national governments and concerted efforts of all donors.

Progress in developing strengthened national research capability and more effective technology transfer systems remain high priorities for the Regional Bureaus and many Missions. All Bureaus concur with the intent of the Audit's recommendations for insuring integration of center activities and technologies in design and implementation of A.I.D. projects. However, there is a general consensus that knowledge of, and interaction with, the IARCs is substantially higher than the report indicates.

New procedures for determining and administering A.I.D. funding are being implemented as a result of a joint PPC-S&T study report issued in June. We believe that the changes made address most of the concerns of the Audit in the area of program administration. We strongly disagree, however, with the recommendation concerning set funding limits and we have tried to clearly enunciate the Agency's policy in that respect.

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Our full response provides a detailed discussion of these and other issues. We understand that our response will be printed in full as an annex in the Audit report.

Clearances: PPC/AA:AHerrick CBH Date 18 Dec 85  
ANE/TR/ARD:ERice Phone Date 12/13/85  
AFR/TR/ARD:MWinter Phone Date 12/13/85  
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## I. INTRODUCTION

The Audit of International Agricultural Research Centers (IARCs) sponsored by the Consultative Group on International Agricultural Research (CGIAR) by the Office of the Inspector General identifies a number of the important constraints facing agricultural research and development programs. However, most of these constraints are well known, and, more significantly in the case of this audit, few reflect inadequacies in the scientific research and outreach activities of the International Centers. Some comment on these recurrent themes is appropriate before moving on to directly addressing the report's findings and recommendations.

The constraint category includes many of the problems repeatedly cited in the report: weak national research programs; poor or non-existent extension services; lack of seed production and distribution programs; limited availability of basic inputs; poor infrastructure for transport storage and marketing; and, unfavorable agricultural policy background. Although addressing these issues in the strict sense lies beyond IARC research programs, mandates and resources, the centers have made key contributions toward ameliorating some of these widespread problems.

### Technologies are being used

Because of the above broad-scale problems, the Audit report asserts that technologies generated by the centers are generally not being used by farmers. It would be more correct to observe that despite these problems, many of the technologies generated by the centers, usually research institutions in developing countries, are being adapted and used by farmers. It is this issue which represents the overriding focus of the efforts of the scientists of the IARCs--generation of technologies that will be used to solve the chronic, and once labelled insoluble, problems of food production in the developing countries. It is also the principal basis of this response to the IG Audit.

The classic examples of successful technology development, adaptation and spread are the "green revolution" rices and wheats. Although these have no doubt been cited many times, they bear scrutiny again. From almost no acreage in 1966, these varieties generated and promulgated by IRRI and CIMMYT, in cooperation with country programs, have spread to some 50% of wheat and rice land in developing countries--over 150 million acres (excluding communist Asia). The research needed to further extend these advances continues, as well as vital research on pests and diseases necessary for the maintenance of high yield levels.

The Audit, apparently by inference drawn from an evaluation of A.I.D. projects involving agricultural research, asserts that new technologies are not only not adopted by farmers, but that they are generally not benefitting the small farmer. The wheat and rice figures above would clearly dispute the finding that farmers do not adopt new technologies. There is also a considerable body of evidence that small farmers benefit proportionally about as well as larger farmers.

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### Need for long term perspective in evaluating research

A.I.D. can proudly point to a long record of strong support for the research that made this quantum leap in cereal grain production possible. However, it should be noted that the research was begun many years prior to the beginning of A.I.D. support (and nascent impact). Time scales for research efforts must be understood by those providing financial support if programs are to achieve a significant degree of their potential. In many respects, agricultural research resists definition as a project with "target dates" and strict forward planning. Rather, it is a continuing, evolving effort, where each new decision builds upon recently generated results. It requires stable support, commitment to excellence, and long, patient work.

A close review of the research results generated by the centers does show that potential for large and continuing impact on production exists. Exciting advances are being reported in research on sorghum, millet, maize, cassava, cowpea, chickpea, beans, potato and other crops (examples are found in our detailed comments which follow). Substantial gains have been made in developing wheats for acid savannahs and rices for upland areas. Early signs of impact in the growing numbers of varietal releases by national programs are evident; some of these releases are referred to in the body of this response.

### Efforts are being made to strengthen national research programs

Understaffed, poorly supported or otherwise ineffective national research programs are clearly recognized by the CGIAR donors as important obstacles to testing, adaptation and adoption of new technologies. To help strengthen national research and extension programs, the CGIAR centers have developed numerous training and educational activities. Varying from specific short courses to long term in-service and academic training, educational opportunities have been offered to over 20,000 research scientists, technicians and extension personnel drawn from throughout the developing world. It is important to remember, however, that the International Centers are relatively minor players in that they only represent 5% of the funds spent on agricultural research in the developing world.

An additional approach to the strengthening of national research capabilities was undertaken by the CGIAR with the creation of the International Service for National Agricultural Research (ISNAR) in 1981. ISNAR works with national systems to assess pressing problems and develop plans for action. To address the need for better understanding of food and agricultural policies, the CGIAR in 1980 began sponsoring the International Food Policy Research Institute. Both are small institutions grappling with immense problems, but they do reflect the concerns of A.I.D. and other CGIAR donors, pursuing activities which are an important complement to the agricultural research conducted by the centers.

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AID participates in a comprehensive and analytical system

The CGIAR system and its donors go to great efforts to stay abreast of current problems and to review center and system performance. The system has, from the start, had an active Technical Advisory Committee (TAC) with members from both developed and developing nations; its Secretariat is located in the Food and Agriculture Organization (FAO) in Rome. In addition the CGIAR Secretariat in Washington has several scientific and management advisors. Donors have their own technical resources. A considerable amount of planning review, and evaluation is conducted within the system. The group has, for example, recently completed a very extensive and detailed impact study and is completing a budget and finance study. Others are contemplated.

AID is involved in the CGIAR mechanisms more closely than any other donor. This reflects 1) the size of its contribution, 2) the degree to which AID staff are involved in system deliberation and decision making, and 3) its extensive contacts with the larger national and international agricultural research communities. AID's participation is accomplished through a small, but active staff, together with administrators and colleagues in S&T, PPC and the Regional Bureaus. Very limited human resources are available for this line of work and demands on staff time are very great.

AID internal management is being formalized and broadened

Nevertheless, moves are underway to address some of the managerial concerns expressed by the IG in its report. The recently completed report of the Joint Bureau for Program and Policy Coordination (PPC) and Bureau for Science and Technology (S&T) recommended a mechanism for arriving at funding levels which will involve PPC and S&T and the Regional Bureaus. This recommendation, as well as the others made by the Committee, is currently being implemented. Considerably more documentation will be produced under the new procedures, demonstrating and recording the assessments and judgments that go into the development of AID support levels for the centers. A great deal of thoughtful review and planning, involving the entire Agency, is reflected in the report of the Joint Committee. The recommendations and their on-going implementation will address many of the procedural and managerial issues raised by the IG in the Audit.

AID's response to the Audit report is divided into three sections, which follow. The first is composed of brief comments on the Executive Summary of the Report. The second consists of a detailed response to the body of the IG report. The third consists of a brief response to each of the recommendations.

IG Note: Because of their length and general lack of responsiveness to the audit findings, the next 21 pages of Agency management comments were not included in this appendix. However, where appropriate, those comments were used to modify the report.

Management's specific comments on the report's recommendations are included on the following pages.

#### IV. COMMENTS ON RECOMMENDATIONS

The Audit provides seven recommendations, which relate to three subject matter areas. We are in general agreement with the intent of the recommendations. However, we view the current situation somewhat differently than the IG (as noted in the previous section) and have already taken actions which will address some procedural questions raised by the IG. Also the Audit report was based on a sample; a different sample might have produced somewhat different suggestions. Hence we think that a somewhat less rigid phrasing of the recommendations in several cases would be more appropriate. We have provided some suggestions on specific wording (and in one significant case a percentage) and have some comments on the feasibility or method of implementation.

In general, the recommendations do not deal with the international centers themselves, but rather with administrative procedures within AID or problems within developing countries which lie outside the mandate of most of the centers. The centers are only one element - albeit a critical one - in the package of activities which must be undertaken if agricultural development is to be stimulated. While we can, where needed, modify AID administrative procedures, other steps at the country level involve a much more complicated array of considerations, many of them well beyond the influence of one external donor.

Our responses to the recommendations are fairly brief and are derived from information and analyses presented in the previous section.

#### Use of International Agricultural Research by Farmers

- 1) We recommend that the Bureau for Program and Policy Coordination revise the AID Agricultural Sector Guidance to require the integration of International Agricultural Research Centers results into agricultural research and crop production projects and programs.

Comment: The reference here is to integration into AID country projects and missions. We fully agree that this integration should take place but think that it already has to a larger degree than the Audit study indicates. It is now standard practice in each Regional Bureau to include detailed analyses of existing and potential relationships with relevant international centers. In some cases, such linkages may be negligible since the international centers do not cover every commodity or production situation. Hence we question the need for formal action.

If, however, something more needs to be done it might take a different form: (a) a reminder from the AID administrator, and/or (b) a change in the language in Handbook 3 on technical feasibility at the Project Paper stage to specifically include a review of relevant IARC research when designing bilateral agricultural research projects. If the Audit recommendation were to stand largely as it is, we suggest: (a) changing "require" to "recommend" or "encourage," and (b) the insertion of "relevant" before "International."

- 2) We recommend that the Bureau for Program and Policy Coordination require that Project Papers for bilateral agricultural research or crop production projects contain a specific and detailed description on how national agricultural research organizations must coordinate and cooperate with the appropriate International Agricultural Research Centers in the project.

Comment: This is a variant of recommendation No. 1 and our response is similar. We agree with the intent but think that coordination and cooperation generally exist. Nearly all recent agricultural research and extension project papers in each Regional Bureau include a discussion on national program - IARC cooperation in areas such as germplasm exchange, training and technical assistance. Given the degree to which the recommended procedure has already been implemented, we think that program guidance is more appropriate than a program directive. We suggest that "require" be replaced by "recommend" or "encourage"; and "must" by "can."

- 3) We recommend that the Bureau for Science and Technology evaluate agricultural programs which created direct linkages between national agricultural researchers and farmers and provide lessons learned to the appropriate office.

Comment: We agree with the importance of the transfer of technology and the need to find ways of improving it. There is, however, more work underway on this subject than may have been apparent. At the center level, such linkages are encouraged and are often carried out through national demonstration trials and farming systems research. An AID working group is in the process of producing three papers on agricultural extension, including one on making more effective use of the private sector. AID has a large portfolio of bilateral projects that include on-farm trials or other adaptive research methods (some under the rubric of farming systems research.) The Bureaus for Latin America and the Caribbean, and for Africa, for instance, sponsor several country projects which provide for direct linkage between researchers and farmers. Central bureau funding is being provided to three projects on technology generation and transfer (with the Universities of Minnesota, Illinois, and Florida).

We question whether additional activity is needed. If, however, an evaluation and documentation of lessons is still thought necessary, learned, perhaps it could be carried out by the Center for Development Information (CDIE) in PPC. Since such a study would involve considerable in-country evaluation other donors might be interested in a joint effort.

Publications and Language Used

- 4) The Bureau for Science and Technology should request IARCs to write their publications for a broader audience than scientists and in less technical terms. Also, the Bureau should request IARCs to translate important publications in French and Spanish.

Comment: We agree with the need for broader diffusion of center findings. There are currently many activities and developments in this area.

Technical publications from the centers are generally appropriate for their principal clientele: national agricultural research programs. The centers also produce highlight reports, newsletters, and other publications which are designed for a broader audience. The responsibility for preparing publications for extension use within a country must, for a number of reasons, fall to the national programs. It is possible, however, that the international centers could do more in the way of developing generalized extension-type reports which could be adapted and translated into the local language. IRRI has produced some publications of this type and it may be useful to see how this program has worked out and how other centers feel about the need (it is probably more easily done for a single crop center than one which works on many commodities).

In the case of translation, the IG's report does not indicate a full knowledge of: (a) the extent to which centers already publish in languages other than in English, (b) the extent to which the centers are moving toward the acquisition of computer translation capability, which should significantly lower translation costs, and (c) the extent to which English is the common international language of agricultural research. CGIAR donors have repeatedly expressed interest in the translation question. Centers are well aware of the translation needs they face and are in the best position to judge translation needs.

Hence we will, as in the past, keep these matters in mind, and will encourage and assist center efforts as appropriate.

- 5) The Bureau for Science and Technology should review its requirements for distributing IARC materials and determine which AID offices should receive IARC materials and to what extent.

Comment: We agree with this recommendation and will endeavor to implement it. The S&T office which distributed center material no longer exists. A new plan has recently been developed which places responsibility for direct distribution to designated AID offices on the Centers themselves.

Funding Procedures Need to be Reviewed

- 6) We recommend that PPC establish that (sic) 25 percent level to be the maximum funding for any center.

Comment: We agree with the idea of an upper limit be set for our usual contributions to each center, but totally disagree with the recommendation that the level be set at 25%. We do not think that IC has built a case for this level, nor would it be in the best interest of the agency to do so. It has been AID policy to provide, within the limits of its financial resources, 25% of the funding for the CGIAR system, but we have traditionally allowed our allocations to individual centers to vary from 0 to roughly 35%. There is very good reason for this: it allows us, within limits, the flexibility to allocate our funds in the most efficient and effective way. The recent special study by PPC and S&T, approved by the AID administrator, recommended "...that AID funding to a given center not exceed 35% of the center's core budget except under unusual circumstances and for short periods of time." We are currently following this policy.

- 7) We recommend that PPC establish evaluative guidelines to be considered in arriving at the annual contribution to each center. These guidelines should include assessment of coordinations (sic) with affected countries, technology made available, matching of AID agricultural research priorities, and meeting target dates.

Comment: The text of the Audit lists 17 criteria which we are currently utilizing in arriving at the annual contribution to each center. We believe that these criteria, occasionally augmented by other special factors, are appropriate and adequate. We do not sense that IC feels that they are otherwise (except perhaps for not including "meeting target dates," which at best are difficult to define in an on-going research program).

The process of making the allocations is becoming more formalized. For example, as recommended in the PPC-S&T Committee report, S&T-PPC met this fall with regional bureaus, at an Agricultural Sector Council meeting (which also includes BIFAD), to discuss proposed funding allocations, the reasoning behind them and important center-related issues. More extensive documentation has been produced, describing in detail AID's assessment of individual center's progress, financial situation and program quality and relevance. Records of deliberations and decisions will be kept. Nevertheless, while the process is more formal, it is not possible nor would it be advantageous to reduce funding decisions to a formula: informed judgement has always been, and will continue to be a vital factor.

We believe these new guidelines and procedures will substantially satisfy the concerns and recommendations of both the IC Report and that of the Joint PPC-S&T Committee on CGIAR.

List of Recommendations

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<u>Recommendation No. 1</u>	7
We recommend that the Bureau for Program and Policy Coordination revise the AID Agricultural Sector Guidance to require the integration of International Agricultural Research Centers' results into relevant agricultural research and crop production projects and programs.	
<u>Recommendation No. 2</u>	7
We recommend that the Bureau for Program and Policy Coordination require that Project Papers for bilateral agricultural research or crop production projects contain a specific and detailed description on how national agricultural research organizations will coordinate and cooperate with the appropriate International Agricultural Research Centers in the project.	
<u>Recommendation No. 3</u>	8
We recommend that the Bureau for Science and Technology in coordination with the geographic bureaus:	
a. advise Missions of the importance of creating direct linkages between national agricultural researchers and farmers to overcome technology transfer constraints; and	
b. provide the Missions with the lessons learned from recent evaluations on the effectiveness of direct linkages between researchers and farmers in the transfer of technology.	

Recommendation No. 4

24

We recommend that the Bureau for Science and Technology ask the International Agricultural Research Centers to write their publications for a broader audience than scientists and in less technical terms. Also, the Bureau should ask the Centers to translate important publications in French and Spanish.

Recommendation No. 5

24

We recommend that the Bureau for Science and Technology determine its requirements for distributing International Agricultural Research Centers' materials and determine which AID offices should receive the Centers' materials and to what extent.

Recommendation No. 6

29

We recommend that the Bureau for Policy and Program Coordination develop guidelines to use in establishing the annual contribution to each Center. These guidelines should include the extent of coordination with lesser developed countries, technology made available, and matching of AID agricultural research objectives and priorities.

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