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**AGRICULTURAL
RESEARCH
PROJECT II**

**REPORT OF
THE MAY EXTERNAL
EVALUATION TEAM**

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Executive Summary

INTRODUCTION

The Agricultural Research Project, Phase II (ARP II), is nearing its second anniversary. In its short life, it has accelerated the process of enhancing Bangladesh's agricultural research system. The Project's primary linkages are between the Bangladesh Agricultural Research Council (BARC), the host country institution, and the International Agricultural Development Service (IADS), the contractor. Through BARC, the Project's activities will extend to the country's agricultural research institutes where technologies are being developed for Bangladesh's farmers.

The BARC Executive Vice Chairman (EVC) has overall responsibility for the implementation of the Project and he is assisted by the IADS Project Supervisor. Project Specialists work with the BARC Member Directors in their inter-institute coordination roles and support the administrators and scientists in the research institutes as they help carry out the research programs.

What follow are the External Evaluation Team's overall impressions of what this alliance has tried to do, how well it has worked, and some general suggestions on aspects of the program that the Team feels might be improved.

The Team's purpose was not to audit the Project's performance. Reduced to single objective, the Terms of Reference indicated that we were to provide the Project with a catalyst. We became the Project's means of doing a constructive self-criticism and, in this exercise, we have served as the recorders, sifters, and synthesizers.

Candor was the dominant characteristic of every discussion that we had. This is a positive sign that everyone has become deeply involved in this ambitious enterprise and wants it to be successful.

RESEARCH SYSTEMS PLANNING AND MANAGEMENT

BARC has the leadership role in agricultural research and planning for Bangladesh. It is mandated to coordinate the national agricultural research program by developing the national agricultural research plans and reviewing the annual plans of the institutes that carry out agricultural research. In addition, BARC has funds available (from USAID and IDA) that allow it to contract for specific research studies. This provides a capacity to respond to research needs that fall outside the usual scope of the research institutions, which have either rapidly increased in priority or are needed to coordinate the activities of several institutions.

The breadth of BARC's activities does not allow its small staff to do everything it would like to accomplish its goals. The Project Specialists are in a position to help, but some have not been used very effectively. BARC and IADS have yet to develop the rapport that should exist, and IADS has not provided some of the professional management capabilities required to support its activities. There is evidence that this is changing. A new Project Supervisor has recently arrived, and most of the IADS Specialists are now on duty so that the necessary manpower is available. IADS seems now to be in a position to function more effectively and expresses its enthusiasm to work with BARC to improve Bangladeshi agricultural research.

TECHNICAL SUPPORT SERVICES

BARC's International Program Service Unit (IPSU) provides administrative support services to international-donor research projects. Its mandate is to develop a strong local capacity to efficiently handle logistic, accounting, fiscal management, office support, and commodity procurement functions. In some of these tasks IPSU has performed well. In others, despite its good intentions, it has been unable to give the level of support required by the Project. Particular difficulty has been experienced because of inadequate attention to housing logistics, financial disbursements, and budget planning.

The causes for these problems are many, and responsibilities must be shared by BARC and IADS. It is now time for a joint effort to see how the existing arrangements may be modified to better serve the needs of the Project. What must be balanced are BARC's desires to have a strong in-house support capability and the realistic need of an important research Project, while recognizing the inherent constraints under which Bangladesh government institutions must work.

FARMING SYSTEMS

The central feature of the recent developments in the Bangladesh agricultural research system, and the key to the ARP II itself, is the strong orientation to on-farm relevance. This approach, new to Bangladesh, endeavors to develop a more productive food and fiber growing system explicitly within the constraints and environments faced by the farmer. This is an interdisciplinary thrust, under the lofty banner of "Farming Systems Research" (FSR).

FSR is supposed to take a comprehensive view of a farming system and this is fairly well-reflected in the baseline surveys conducted in the trial area. At this stage, however, the mass of information collected on farmers' circumstances has yet to be analyzed in a very fruitful way. Presently, the emphasis is confined mostly to integrating various sequences of crops under several improved practices and comparisons of the profitability of alternative cropping patterns. The work would thus be more accurately described as "Cropping Systems Research" (CSR) to indicate the minimal attention to livestock activities and non-cropping labor allocations, fisheries, forestry, and horticulture.

The redirection of biological and social scientists' research efforts to work in farmers' fields is a significant achievement. The unified approach achieved through the National Coordinated Cropping Systems Research Program is a major accomplishment of BARC and the Project.

Many research questions remain unresolved, as is to be expected from the inherent complexities, dynamics, and uncertainties in the Bangladesh farming systems, and from the still evolving science and art of FSR. As the CSR matures to FSR, it should yield a rich harvest of applicable recommendations to farmers, and of useful hypotheses fed back to scientists in their continued efforts to bring good science to bear in generating productive innovations.

ECONOMICS AND SOCIAL SCIENCE

Enhancement of research on economic and social science aspects of the agriculture of Bangladesh could take many forms. Problems span all levels, ranging from farm management and production economics, through marketing and price formation to analysis of agricultural policy. BARC and the Project have elected to concentrate on only the first level. The intentions of this part of ARP II were to focus on socio-economic analysis in the Farming Systems Research, and on research resource allocation more generally, including attention to the distribution of benefits.

Only the first of these has so far been addressed and, as described in the FSR review in Section 2.3, the economic and social component of the CSR is very underdeveloped.

Great scope exists for BARC to improve the interchange of information and to foster coordinated rural research activities in social science. This would involve bringing together, perhaps through contract research, agriculturally-oriented economists and other social scientists, most of whom are working outside the BARC group of institutions.

CROPS

Bangladesh's capacity to do effective rice research has been well-established through the successful operation of BRRI. The emphasis in the BARC Crops Research Program is to develop such a research system for other food crops, and then promote their integration into rice-dominated production patterns. The plan is to integrate all of the relevant concerns, which range from breeding and fertilizer management, to socio-economic considerations, including the productive role of women through improvements in homestead gardening. Much of the integrative work is to be accomplished through the Farming Systems Research program. (It is discussed separately above.)

The major successes to date have been in wheat, the summer pulses, mustard and potatoes, although much remains to be done. Further achievements are close in some crops, including maize, kheshari and cabbages. The traditional disciplinary barriers to cooperative research have been broken down to some extent, but there is still much compartmentalization of interests, even in the cropping systems trials. Efforts to encourage more interdisciplinary problem-oriented work must continue.

LIVESTOCK

Livestock, a very important component of the farming system in Bangladesh, has been much neglected by rural research. This neglect has carried over to the Project itself where, even in the Farming Systems Research program, little attention is given to livestock and fisheries activities. Appointments of a BARC Member Director (Livestock) and the filling of the Livestock Specialist position would assist the launching of needed research work. Creation of a Bangladesh Livestock Research Institute should also greatly assist progress as trained scientists become available to work in livestock research.

SOIL MANAGEMENT

Bangladeshi farmers sometimes see little improvement in their crops after they have added fertilizer. Proper fertility management can, of course, increase yields and raise productivity. The challenge, then, is to develop a system in which economically efficient fertility requirements can be determined and to provide this information to the farmer in a way that can assist his decision making.

Putting such a system in place requires a combination of people trained to take proper samples, a service laboratory geared to the prompt analysis of these samples, and a body of interpretive information that gives meaning to the analytical results. From this, a trained person can better advise the farmer on alternatives for increasing crop yields economically.

The plan for such a system is in place, and the equipment, staff, and procedures are being readied to provide the analyses. Experiments that will give some of the interpretive information are underway; but, because this facet of the program is not easy, it will require considerable additional planning and research efforts.

Will this plan get useful results into the farmers' hands? Probably, the Team believes, if the system comes into full operation, and if its results are integrated with those from socio-economic and farming systems studies. Success ultimately will be conditioned by the farmers' access to both fertilizer and credit.

WATER MANAGEMENT

For many areas of Bangladesh, irrigation is the key to increasing the number of crops grown on a field in a year and hence its overall productivity. A massive program of tubewell construction is underway to provide irrigation water. But successful irrigation involves more than installing wells.

Some good answers to the many significant questions will come from studies on components of the irrigation system--e.g., determining the proper match between motor and pump capacities. However, integrated studies are necessary to guide the development of irrigation. Engineering must be combined with relevant aspects, such as crop requirements, social constraints, economic cropping patterns and extension. Technical Assistance activities have been slow in building, but should soon gain momentum as the staffing is completed. Already, a series of Contract Research Projects is underway and trainers are being trained.

Planning is being done to set the detailed implementation priorities. This will be a difficult task, for this is a large program that must coordinate researchers from nearly a dozen institutions, many of whom have not worked together before.

PEST MANAGEMENT

Pests damage a farmer's crop from the time it is planted until it is consumed. Estimates of the losses are sufficiently large to make this an important factor in determining a farmer's effective yield from his crop production activities.

Research was begun early in the Pest Management Program, sponsored originally by ARP I funding. Studies have been restricted particularly to vertebrate pests (primarily rats, bandicoots and birds), as they damage rice, wheat, and maize crops.

Successes have been notable. Development of rat control bait has progressed to where there is now a local production capability and widespread adoption by farmers. Other studies are not as advanced, but show similar promise. Training will soon result in a complete complement of local scientists, and it is expected that the research activities will gradually be turned over to this local staff.

The difficulty in this program has been its neglect of non-vertebrate pests. IADS and BARC should move quickly to fill the Technical Assistance positions for an entomologist and a plant pathologist.

MANPOWER PLANNING AND TRAINING

It is widely recognized that, in agricultural research, human rather than physical capital is critical to productivity and success. The Project has reflected this understanding through its substantial training programs. These range from in-country training activities, directed at farmers and extension workers, to more formal enhancement of human capital through postgraduate training in the U.S., Bangladesh, and third countries, and short courses and sabbatical leaves. If all the proposed training is carried out, the foundations for long-term self-help in Bangladesh's research will have been significantly fortified.

Training supported by the Project has made a slow start in terms of financial expenditures, but a sound one through the careful attention that has been given to developing a system for selecting candidates. The procedures now in place are working

smoothly, and the flow of candidates and resources will very soon be at the desired rate. Refinement of the manpower inventory is an unfinished, ongoing task on which useful progress has been made. As it continues, it is hoped that the perception of priority needs will direct candidate selection even more purposefully. Progress on training requires increased staffing of the Training Cell and greater freedom for people to leave Bangladesh for training purposes, including participation in international workshops and observational/study tours.

COMMUNICATION AND INFORMATION SYSTEMS

The importance of the ready flow of information into and out of a research system is paramount. It is recognized in the Project in various ways, including training and extension linkages. Under this heading, however, the focus is on library and information resources, and communication of results and achievements. These aspects all require a great deal of improvement in Bangladesh before they can be regarded as satisfactory.

In Project terms, this is a recently initiated program, and comment on achievements would be premature. The Team is, however, favorably impressed by the action plans that have been drawn up after the recent joining of the Information Specialist. It is hoped that rapid and effective progress will put scientists in better touch with the world literature and in getting news of research achievements into the hands of the public at large, national decision makers in particular.

FOSTERING LINKAGES BETWEEN RESEARCH, EXTENSION, AND FARMERS

It is essential that linkages exist between scientists and farmers. Sometimes these are direct; at other times, they exist through the extension service. CSR has encouraged some scientists to deal directly with farmers. The regional stations are being strengthened and are starting to work with extension personnel and farmers to develop regional research programs. Regular field days for farmers and extension officials are being held on the regional stations for the first time.

Several USAID-funded programs have joined research and extension workers to provide benefits to farms of all sizes. The rat control campaign, based on vertebrate pest control research, has saved large quantities of wheat. The summer pulse program, which was operated through the regional farms, extension service, BADC, and private seed dealers, resulted in the spread of pulses to about 16,000 ha in 1982.

This Project linkage is severely constrained at present by shortages of operational funds, travel restrictions, and the continued weakness of the regional stations. However, several improvements are possible. The BARI on-farm trials division and the CSR sites are still under-utilized resources that need to be exploited further. Regional research programs must be strengthened through more resources, and permission should be eased for travel to farmers' fields that are not conveniently close to the stations.

ROLE OF THE SPECIALISTS

People are a key ingredient in any large program, and ARP II is no exception. The Project has gone through a rapid buildup of its Technical Assistance staff during the past year. This means that most of the people necessary to help carry out the Project's activities are now on duty. This is a well-qualified staff that is eager to get on with this challenging task.

The rapid influx of so many people has also caused some problems, most of which are diffuse and difficult to pin down. For example, although a clear need for good collegial relationships and close coordination between Specialists and their counterparts exists, in some cases, these have not yet been developed. This takes time and effort on both sides. Until this happens, the Project will not be fully utilizing all the talents of its experienced professionals.

Another aspect of this problem is the relatively low priority that has been given to developing adequate planning documents. This has left some Specialists without clearly understood guidelines for their activities and the resources available to them. This facet of the Project's management needs to be given more attention.

The size of the Technical Assistance staff itself has resulted in crowded facilities. This, in turn, has created a difficult work atmosphere. This is a problem that needs to be faced, now that the staff is nearing its maximum size.

USAID

USAID has had a strong role in the development of this Project. The planning that went into the Project Paper and Contract was sound but, from the present perspective, might be judged to have been over-optimistic about the ability of BARC to develop its capacity and influence so that it can use such a large body of resources.

In terms of continuing support and guidance from USAID, the Team has been impressed with the cogency of the repeated advice and questioning to assist in financial, technical and managerial aspects of the Project. The Project Officer, in particular, is to be commended for her continuing supply of insightful suggestions for improving the operations of the Project.

1. Goals of the Project

The Agricultural Research Project, Phase II, began in July of 1981. It is concerned with the development of agriculture in Bangladesh, primarily through the selective enhancement of the country's agricultural research system.

The specific objective of this Project (Contract, Appendix A, p. 2) is "to increase the effectiveness of agricultural research necessary for development of appropriate technology to Bangladesh farmers." Phase I was concerned with the establishment of a functioning Bangladesh Agricultural Research Institute (BARI), particularly building the physical facilities, core staff, a research program of priority and multidisciplinary research projects, and budgetary support for its research activities. Phase II's activities are to further strengthen all of these areas. Emphasis is not just on adding to existing programs, but to further assemble these into an agricultural research system, relevant to the country's agricultural development objectives.

The emphasis on the integration of component research studies has been incorporated into the implementation strategy. To do this, a Farming Systems Research framework has been designated as the context within which the core research programs will work (Contract, Appendix A, p. 2). Specifically, the Project is seeking to establish the necessary conditions for the widespread application of this research approach by focusing attention on three areas (Project Paper, p. 33).

Institutional coordination: the role of BARC will be strengthened through technical assistance, training, and equipment support. Linkages will also be developed further with extension and research programs.

Core discipline development: specific research disciplines will be identified, which contribute to solving the problems identified in the farming systems studies. These disciplines will then be supported with the development of manpower, equipment and logistical support; this will allow them to carry out research in farmers' fields as well as on research stations.

Research support services: research station administration, financial management, technical library services, communications, and data processing will be strengthened with the addition of technical assistance, training, equipment, and supplies.

In addition, the Project recognizes the need to use Project funds to mobilize the existing research system to help solve problems that contribute to the same goals (Project Paper, p. 34).

The Farming Systems Research approach involves collaboration across disciplinary and institutional lines. It operates with a broadly based team examining farm-level constraints to production, then feeds this information back into the research system. New technologies are then developed at the research stations and subsequently tested in the farmers' fields. It is then possible to extend this information, with careful monitoring to assess its rate and mode of adoption (Project Paper Amendment, p. 6).

There are several broad goals that the Project is expected to accomplish (Project Paper Amendment, Annex B-1). There should be an effectively operating Farming Systems Research program. BARC should be providing effective coordination and direction to the national agricultural research effort. The core research programs, especially at BARI and BRRI, should be expanded.

Resource components have been provided to this Project in two groups (Project Paper, p. 13): Those activities that provide support services to research programs and those core disciplines that address specific farming systems improvements. Together, there are nine component activities.

There are three components of the research support activities: research system management, farming systems research (on-farm trials), and library and communication services. The purposes of these component activities are to contribute to the coordination and support of a Farming Systems Research program (Project Paper, p. 14).

Research systems management: provide a system for research management, planning coordination, implementation, technical and financial monitoring.

Farming systems research: develop and implement a comprehensive research effort that will identify more productive uses of the limited available resources of the entire farming system.

Library and communication services: strengthen BARC and the participating institutions' agricultural research information and communication services; expand their libraries and documentation services.

The other six component activities are directed at specific disciplinary activities (Project Paper, p.16): Economic and Social Science, Crop Research, Livestock Research, Soil Management, Water Management, and Pest Management.

An Amendment to the Project Paper was prepared in July of 1982 to support an expansion of the Water Management program and to contribute to a consortium effort for a technical assistance and training program at the Bangladesh Rice Research Institute (BRRI). (This BRRI activity is not within the scope of this evaluation.) This Amendment does not change either the purpose of the overall Project (Project Paper Amendment, p. 2) or the farming systems framework in which it is to be implemented (Project Paper Amendment, p. 18).

The Agricultural Research Program, Phase II, contract involves USAID as the Donor, the International Agricultural Development Service (IADS) as the supplier of all project planning and implementing services, and the Bangladesh Agricultural Research Council (BARC) as the representative of the host government.

It has been noted explicitly (Contract, Appendix A, p. 2) that this Project will:

- (a) build capabilities to move agricultural research activities into farmers' fields where production problems can be identified and solutions tested;
- (b) build strong, responsive core discipline research programs within a "farming systems research framework" to develop the new technologies that can address these production problems;
- (c) concentrate efforts to link different agricultural institutions into a research system relevant to achieving the country's agricultural development objectives.

To do this, the Project provides equipment, training, program development support, and high-level technical advisory assistance. It is expected that this will lead to "some reorganization of institutes and reorientation of scientists involved in agricultural research." (Contract, Appendix A, p. 3).

The organization of the Project is as follows (Contract, Appendix A, p. 13):

- o The BARC Executive Vice Chairman (EVC) has overall responsibility for implementation of the Project. He is assisted by the IADS Project Supervisor.
- o The Project Specialists work closely with BARC Member Directors in their inter-institutional coordinating roles, and with institute directors and scientists in the institutions that carry out the research programs.

- o Supervision of the Specialists is the function of the Project Supervisor. He also provides the communication link between IADS and BARC. A Senior Specialist acts as Deputy Project Supervisor and assists in these duties.
- o In cases where a Bangladeshi scientist is abroad for training, a Specialist may be asked to take major research responsibilities until the training is complete.
- o Most of the Specialists are assigned to work with BARC's Member Directors and are based at BARC itself. Eight Specialist positions are assigned to BARI or its regional stations where they participate in BARI's programs or assist its administrative or research staff (Contract, Appendix A, pp. 5-10). The BARI-assigned Specialist positions are: Farm Development Specialist, Associate Production Agronomists (4), Agricultural Economist II, Agronomist, and Plant Pathologist.
- o Consultants are provided to assist Farming Systems Research programs, research-extension linkages, or to strengthen BARC's capacity for agricultural research coordination (Contract, Appendix A, p. 10).
- o The Project Supervisor and Specialists are to develop a "Five-Year Master Plan of Action" by March 1, 1982 (Contract, Appendix A, p. 13). This group will also prepare annual work and financial plans, in collaboration with BARC and the other institutions involved in the Project. These are to be submitted by July 31 of each year. Semi-Annual Reports will be prepared, which report major activities, progress, problem areas and required actions, a review of the status of the 21 Moseman Report recommendations, and a financial statement (Grant Agreement Amendment, No. 1, p. 2).
- o Quarterly meetings of a BARC-appointed Project Advisory Committee are intended to review progress, coordinate all Project activities, and identify and remove all system constraints. The BARC EVC convenes and chairs this meeting of BARC representatives, the participating institutions, USAID, and the Project Supervisor (Contract, Appendix A, p. 13).
- o Two external reviews are scheduled to coincide with the second and fourth annual reviews. The major purpose of these external reviews is to determine if the implementation objectives are being achieved (Contract, Appendix A, p. 14).

2. Ability to Plan, Implement, and Achieve

2.1 RESEARCH SYSTEMS PLANNING AND MANAGEMENT

BARC is nearing its tenth anniversary. In this short time, it has attempted to establish itself as the central planning organization for the country's agricultural research program. This has been an uphill battle, for BARC has not been given the resources that would otherwise be considered essential to this task--namely, adequate manpower and power over budgets. Instead, BARC has had to work within its limited resources and to make use of those provided by the ARP II. On the one hand, this alliance has provided BARC with substantial resources. On the other hand, it has presented it with a unique set of management problems.

The observations that follow are somewhat critical. This should not obscure the fact that the Evaluation Team has developed considerable respect for BARC, and recognizes the substantial progress it has made toward its mandate.

The quality of leadership is seen as the key to success in integrated research programs. Therefore, the Evaluation Team has felt the need to be blunt on these management issues.

The Project Paper (p. 14) states that the purpose of this Project activity is to "strengthen and expand research management, planning, coordination, implementation, and technical and financial monitoring whereby a national research system can function and perform effectively."

In the contract itself, the duties are distributed among at least four specialists. The Research Management Specialist is to assist BARC and participating institutes through "better program planning, implementation and evaluation." The Administrative Specialist will "advise and assist in the overall administrative support services provided by BARC to the national research network." The Agricultural Economist II will "advise on socio-economic criteria relevant to research activities and priorities." The Crops Specialist "will assist BARC in planning, implementing, monitoring, and evaluating coordinated crop commodity programs" (Contract Amendment, No. 5).

Progress

Research planning: The Project's main planning achievements to date are an inventory of research skills, creation of a manpower development plan, and an allocation of contract research resources to neglected areas of research. The distribution of contract research funds provided by IDA and USAID is probably BARC's major recent impact on the allocation of research resources. It has succeeded in shifting relatively large sums of money into previously neglected areas by funding studies on water management; cropping systems; soil management; and crops, such as blackgram, kheshari, sweet potatoes, aroids, maize, cheena and kaon.

In addition, individual team members have assisted the EVC and the Member Directors in developing priorities in particular areas, e.g., Dr. Portch in soils, Dr. Kaul on research needs for crop diversification and the Barind Development Project, and Dr. Gisselquist on management needs. Dr. Cushing was brought in as a consultant to develop a master plan for ARP II, although his report (1982) has not been accepted as a plan by the Council.

Coordination: This Project has encouraged coordinated research on a number of important topics including pulses, soil-test crop response studies, cropping systems, and Irrigation and Water Management. The Pulses Contract Research Project involves six institutions. The Cropping Systems Program involves five institutions, and irrigation and water management activities involve six institutions. Before these projects were initiated, there were only a few projects on which institutions worked together. At the start of these Contract Research Projects, scientists from various institutes jointly designed the research projects. The institutions have kept in touch through seminars and reports. In addition, IADS Specialists have been able to increase the communication and cooperation among people working on Cropping Systems Research.

Research management: For BARC to make a substantial contribution in directing the agricultural research program of the country, it must command sufficient management skills to keep its own programs in order, and possibly influence those of the research institutions. Using Project resources, it has made several significant contributions to the systemwide management capabilities. One of the best examples comes from the Training Cell, which now has a substantial body of procedures and criteria it uses to identify candidates for training. Its procedures use the country's needs (such as the need for researchers experienced in rural settings) as important elements in the selection process. It has also set up several training programs in the management of contract research.

Evaluation and monitoring: Criteria for the evaluation and monitoring of contract research proposals recently have been set out in a series of procedural guidelines and forms ("Yellow Book," pp. 17-22, Annex I). A great improvement over the previous procedures, this should provoke better proposals and allow easier and more effective evaluation of their activities and results. Two external evaluations have been made of the contract review process (James, 1982; Hesser et al, April 1983), which provide constructive criticism that should further improve future Contract Research Programs.

One area of management that still needs improvement is the financial management system. The current system, as judged by reports from many investigators, adds unneeded, cumbersome procedures and regulations. In an attempt to remedy this, IADS brought its home office accountant to Bangladesh to review their system (Howe, 1983).

Problems

Planning: At the national level, the Project in its first two years has had little impact on research planning. There still has been no revision of the 1979 National Agricultural Research Plan. As a result, changes in the agriculture of Bangladesh and recent research results have not been reflected in new priorities for the research system as a whole. There are indications that the plan will be revised, but the Evaluation Team was not able to identify any action on this task at present.

BARC's role in national planning has been constrained by its lack of an effective means to enforce its recommendations. BARC is supposed to approve all agricultural research projects that are financed by foreign resources and all projects that go into the Annual Development Plan. However, it does not appear that this rule has been enforced. BARC does not receive the research programs of some institutes, nor does it have the ability to block programs of which it disapproves.

The potential for BARC to influence the allocation of agricultural research resources is growing. The initial Contract Research Program had a total budget of about \$1.35 million, spread over a five-year period; the World Bank is proposing a project that might add another \$9.6 million over five years. These are substantial research resources, especially when one considers that all of the institutes' budgets, except EARI and BRRI, were less than \$1.0 million during 1979-1980.

Through the Contract Research Program, BARC can improve the allocation of research resources. The 1979 National Agricultural Research Plan identified the (then) priority areas for research. It seems that, in general, the 40 IDA-financed and 18 USAID-financed Contract Research Projects provided new resources in these priority areas.

The "Yellow Book" (February 1983) procedures provide some criteria for the allocation of contract research resources. For example, it provides up to 15 of 100 points if a project is "directly related to SFYP goals." However, the division of contract research resources for water management ("Yellow Book," p. 20) seems quite arbitrary, although perhaps necessary to get the program moving.

Through its rapidly increasing contract research budget, BARC's power to influence the direction of agricultural research has and will continue to increase dramatically. The planning and execution of the Contract Research Program can play an important role in establishing BARC's credibility with the research system as an impartial leader in agricultural research. If BARC supports only high-quality research projects that are important to the country, it should build up its credibility to claim leadership of the country's agricultural research program.

Management: The delayed implementation of the Project is noted frequently in Project documents and in this report. The reasons for this, as are detailed in the respective sections, are many and varied. Several major problems can be put forward as general observations. Delegation of decision making is seldom encountered in the Bangladesh system; the consequence is crowding, delay, and hurried decisions at the few decision points. Problems are exacerbated by multiple checking and slow communications. These issues of "management" are not easily grappled with, but perhaps senior staff, both in the Council and the associated institutes, could profit from short courses in management per se.

The other general problem area is the adequacy and timeliness of disbursement. The problems of the regional station managers, for example, are aggravated by the often late release of funds both for operations and salaries. This problem stems in part from the cumbersome internal procedures inherent in GOB administrative systems.

Not all of the implementation delays reside in host-country procedures. IADS has been slow in identifying, recruiting, placing, and retaining suitable expatriate staff. The Team recognizes the challenge of attracting high-quality, international staff to work in Bangladesh when there are so many opportunities for work in "easier" research environments.

The previous Project Supervisor did not put together an effective implementation or financial plan for the Project, and the Administrative Specialist has not developed financial planning procedures beyond those needed for routine bookkeeping. Thus, neither the IADS Team nor the Member Directors know the current status of the Project resources in a way that would allow

them to be managed creatively. In some cases there has been inadequate consultation between the IADS Team and the Member Directors in the development of the annual plans.

Evaluation: BARC still appears to have insufficient staff or committees to effectively evaluate or monitor the research plans and activities of the country's research institutes. The institutes may send in their annual plans, but they do not receive (or, indeed, in some cases seek) useful suggestions on these programs. It is not clear that they would pay attention to any suggestions they might receive.

Evaluation and monitoring of Contract Research Projects has so far been left mostly to external teams. This has provided BARC with some useful evaluation reports. However, BARC has not built its own capacity to monitor research and seems reluctant to allow IADS Specialists a significant role in this area.

Recommendations

The Council should have a full-time Executive Vice Chairman and its full complement of Member-Director and support staff. New Member Directors should be scientists or engineers who are respected by the scientific community of Bangladesh. Meanwhile, it appears that BARC will not have sufficient manpower to effectively carry out the planning and coordinating responsibilities assigned to it. However, by opening up the decision-making process and drawing in more scientists and policy makers, BARC could get the necessary manpower to build its own credibility. A Program Planning and Review Board, made up of outstanding scientists, which would meet regularly to set priorities for research and review the programs of the Institutes, was strongly suggested by the 1979 Joint Research Review Team. It has been recommended by all reviews since then. In addition, Dr. Zaman (BRRI's Director) strongly emphasized to the Team that "BARC should have more meetings so that he and other scientists could actually participate in setting priorities. The first internal review of this Project recommended that BARC, with participating Institutes, review the Program Planning Review Board working paper at an early date" (p. 8). The Team would like to re-emphasize the importance of a board such as this. It seems to be one of the few ways around the manpower problem and is also a valuable way to gain support for BARC.

The Team recommends that BARC, with the assistance of the IADS Team (in particular, Drs. Daugherty and Kaul, but also the other Specialists, when needed), initiate the revision of the 1979 National Agricultural Research Plan. The revision needs to be done in cooperation with all members of the Council, and should also have substantial inputs from extension, agribusiness, and farmers. At least three of the weaknesses of the original

plan need to be addressed: first, the plan needs to be made into an operational plan; second, the plan needs to make explicit the links between the general goals expressed in the government's development plans and the actual research priority areas; and third, the plan needs to have regional components. The third change is particularly important now that both BARI and BRRI have developed their regional stations. These regional plans can build on the information collected in the Cropping Systems Program, inputs from the E and RP, as well as some of the work done by Dr. Rahman and Dr. Kaul on crop diversification, and the Barind Area Development Scheme.

A number of the suggestions of the Contract Research External Review (Hesser et al, 1983) impressed the Team as being excellent. The need for an evaluation six months before the scheduled end of a project for which an extension is sought seems particularly useful in preventing unnecessary delays in providing more money or of stopping useless projects. The employment of impartial external reviewers in the selection and evaluation process would be useful.

IADS has started to develop the plans required to operate effectively. The development of the implementation plan for training and contract research, the "Yellow Book," is a sign of improvement. The Team suggests the Five-Year Master Plan, the next annual plan, must be finished by July 1983. IADS should then be able to improve the research management of other institutions. They must demonstrate their own competence in planning and management, or their advice and assistance will not be sought or welcomed.

2.2 TECHNICAL SUPPORT SERVICES

International Project Service Unit

The predecessor to the International Project Service Unit (IPSU), the International Staff Support and Coordination Cell (ISSCC) was conceived and implemented for the purpose its name implies. The subsequent expansion in scope and number of personnel in research projects required expanded services. IPSU was established to replace ISSCC and serve the broader needs.

IPSU, an integral function and responsibility of BARC, was established to provide administrative support services to enhance the contributions, output, and productivity of the BARC/USAID/IADS Agriculture Research Project and other international donor research projects. Its responsibilities include:

- (a) logistical support for contract Specialists' housing and domestic purposes, and for project operations;
- (b) accounting support;
- (c) fiscal management;
- (d) office management and support; and
- (e) local and off-shore commodities and supplies procurement.

Establishing an effective, functioning unit of this nature requires as a minimum a strong, no-nonsense, experienced administration capable in organization and supervision of activities and staff that: maintains a smooth, continuous, unimpeded flow of work through the system; that is knowledgeable about and competent in logistic and accounting support, fiscal and office management, and commodity procurement functions and procedures.

Logistic Support

Logistic support, when properly provided, permits the Specialists to focus on their jobs. It is evident that this support is inadequate. Many complaints were registered regarding housing. These include the delay in receiving residential furnishings and poor maintenance.

Vehicle availability and utilization has improved with the arrival of the new jeeps and their removal from the motor pool. Since they are new, no operational problems are yet being experienced. Some attention should be given to obtaining spare parts before they are needed; otherwise, vehicles will soon be sidelined.

Specialists assigned to the Project are not adequately briefed on how the system operates. The Team agrees with the importance of orientation. Certainly a packet with suggestions on items to bring to post, conditions at post, information about the country, etc., should be prepared and forwarded to each Specialist several weeks prior to departure for Bangladesh. A thorough orientation is needed on arrival at post on such things as resident visa, passbook, health, travel, work, office assignments, and administrative and office arrangements.

Accounting Support

The accounting operations are responsible for the maintenance of the Project's financial records. In particular, it includes the processing of invoices, maintenance of revolving accounts, the production of budget summaries, and processing vouchers and reimbursements.

All reports the Team received on the accounting/bookkeeping function were favorable. This portion of the system appears to be operating well.

Numerous difficulties exist in the other areas.

A frequent complaint was the slow processing of reimbursements. Payments are often months behind. When funds arrive by check, they must be cleared. This source of delay, noted by the Project, is being eliminated by efforts to send bank drafts.

The revolving account system appears to be working satisfactorily.

Fiscal Management

Fiscal management is responsible for such activities as budget preparation and updating, financial plans, projection, and auditing.

Appropriate budgeting tools are an essential element of good program planning. While the contract requires annual financial plans, day-to-day operations are equally dependent on knowing a program's financial status relative to its budget allocation, expenses, obligations and remaining balances. Provision of more adequate support in this area seems mandatory.

Office Management

The level and quality of office management requires vast improvement. The number and competence of staff have been limiting factors, but certainly not the total cause of the problems. Rather than the office maintaining a typing pool, it may be more efficient if the secretaries were assigned to Specialists.

Crowding two and three Specialist staff members into one small office is not conducive to concentration and efficient output. Efforts should be made to improve office and working conditions for the Specialists.

Office furniture has been provided very slowly, and typewriters are not sufficiently available for Specialists' use. These, too, are important factors in productivity.

Commodities and Procurement

Several Problems exist with commodity procurement, the major one being the delayed release from customs due to delayed payment of customs duties. This is an unfortunate problem, and is turning

out to be a major constraint for the Project. Even after repeated warnings from USAID about deadlines, BARC and IADS failed to get the necessary paperwork processed to get this Project into the A.D.P. on time; the government is now reluctant to add it. In the Team's view, both organizations share responsibility for this major oversight.

Another problem concerns the availability of spare parts. Experience has shown that an adequate supply of spare parts must be ordered with each piece of equipment to assure continued operation.

The commodity receiving and reporting system is currently being operated by the Farm Development Specialist. This appears to be a misallocation of the Specialist resources, but, in the absence of someone trained to do this necessary job, may be an unavoidable situation.

Research Farms and Physical Facilities

Mr. D.N. Sharma, the Farm Development Specialist, is assigned to BARI. Most of his responsibilities now lie with coordinating the completion of activities begun in ARP I and the ongoing problems of operations and maintenance. Physical facilities development at BARI and the regional stations continues. Some land shaping and irrigation pump installation at Jessore and Jamalpur are underway; work is about half complete at Hathazari. The repair shops and equipment are completed at four of the six stations. Training for the field assistants, overseers, machinery operators and drivers, and support staff is underway. Engineering assistance has also been provided to other programs, such as the Oil Seed Project Engineering Department and Potato Research Center. The primary constraints are the shortage of trained personnel, operating funds, and delays in receipt of commodities.

Recommendations

The concept of IPSU seems sound, but it is not working adequately. The Evaluation Team recommends that IADS and BARC discuss those functions that should continue to be managed by IPSU. At the minimum, it appears that logistic support might be handled better by IADS itself.

Better orientation is required for all new Specialist staff.

IADS and IPSU should work together to improve the disbursement process, seeking creative solutions, if necessary, so that unnecessary delays are eliminated. Appropriate technical assistance should be made available to assist in this process.

The budget planning part of the accounting support system has not been functioning. Skills to develop a budget system must be brought to the Project immediately so that the financial planning and budget management functions are appropriately handled.

Office management needs attention. It is important that the Specialists have adequate space, furniture and office machines. Planning should be made for a commodities receipt and inventory system to handle the expected influx.

The commodity procurement problems caused by the customs duties should be resolved and proper attention given so that this problem does not recur.

2.3 FARMING SYSTEMS RESEARCH

In planning rural research that is relevant to farmers, attention must be given to non-agronomic issues, input constraints, market analysis, household and area labor, and farm power availability by season, along with the analysis of constraints to production and implementation, verification and dissemination of research findings.

Conducting research on the small farmers' fields offers great promise for developing appropriate location-specific production and management technologies, so long as pre on-farm research has tested crops and practices for locality adaptability and minimizing risks for the farmer. Realizing the potential requires that a program be designed and implemented for the complete cycle of research.

The recommendations for a given crop, practice, cropping pattern or management technique must be considered in conjunction with other crops or practices that precede or succeed them in rotation, or in the system as a whole. Therefore, it is imperative that the research be based on the relevant set of conditions and interrelationships existing on the farms of the locality, rather than on the research station. Tractor-based, ideal irrigation and input management systems on the research station may show impressive results, but have little applicability on the small holdings that, by necessity, are cultivated with a hoe or animal power, have access to limited inputs and irrigation, or rely on rainfall. Farming Systems Research on cropping patterns and production practices, regardless of the focus, must be conducted in terms of the farmers', not the government's, resources. The farmers require safe bets that a new technology will work. Thus, the scientists must know the local situation and be able to view it from the farmers' point of view dictated by the circumstances "under which they exist."

In the final analysis, research is justified only to the extent that applicable and profitable technologies, innovations, and inputs are developed, and that knowledge is communicated to and applied by the farmers.

The Project Paper envisages a multi-disciplinary small-farm research program. The primary research thrust observed on the stations and the on-farm trials for accomplishing this deals mainly with the agronomic aspects, with some attention to water management. There is less evidence of meaningful economic and social research and no evidence of livestock and animal power research.

Progress

Cropping Systems Research (CSR) is presently the major activity under the general heading of Farming Systems Research (FSR). The emphasis in this work, conducted by various groups within BARC participating institutions, such as BIRRI and BARI, is (a) to compare alternative Cropping Patterns (CPs) or rotations and (b) to explore the potential for intensification (usually to three crops a year).

The common themes in CSR are: (a) conducting a benchmark survey to record existing CPs and other farm practices and details including cropwise profitability and the agricultural labor availabilities and utilizations; (b) designing "improved" CPs featuring intensification, improved varieties, non-traditional crops (e.g., potatoes, maize, vegetables, and sesame, etc.), improved cultural practices (ranging from minimum tillage and more fertilizer to use of insecticide and pesticides, irrigation, etc.); (c) budgeting of costs and returns of "improved" and existing CPs; and (d) distilling findings into recommendations that take into account the circumstances of different categories of farmers identified in step (a).

Though limited, this work represents an improvement from previous methods for testing new technology. In the past, new techniques were tested for yield increases on the experimental stations and then tested by BADG and BARI's On-Farm Trials Division. These tests did not consider the impact of the new techniques on other crops in the rotation, and they did not collect any economic information. They simply recorded the yield. Now, at least, the entire rotation is being considered, and it is being compared with farmers' Cropping Patterns on the basis of costs and benefits.

The IADS Team inherited the present FSR sites and methodology from their predecessors who had used the BIRRI/IRRI methodology. They have been able to improve the field work and data analysis by working with the scientists in the field and

running short courses in statistics. Dr. Greene is about to start training the economists at the sites in partial budgeting, which should lead to site-level analysis that is more appropriate. They will soon be opening up new sites and hope to develop them using the CIMMYT-based methodology, which was quite successful for IADS in Nepal.

The involvement of the anthropologist Dr. Wallace at the BJRI site in Manikganj will provide a model for greater involvement of anthropologists and sociologists at these sites. He is collecting more comprehensive information about the village than are other sites at present, including information on animals and the spread of new technology. The analysis of these data will hopefully provide an example of what can be accomplished by moving outside the narrow CSR context.

A Critique

The philosophy of FSR is holistic in its declared ambitions to be farmer-based, problem-solving, comprehensive, interdisciplinary, iterative, dynamic, and socially responsible. Accordingly, it must be recognized that the present narrower focus on CSR is a partial step toward more comprehensive FSR. Among aspects that presently seem neglected are (a) the interrelationships between CPs and livestock (in terms of both provision of fodder to animals in intensified cropping and of traction and manure services from animals to crop production) and (b) the linkages of farm labor to off-farm labor markets.

Present labor accounting seems to be concentrated on agricultural aspects only. Thus, for example, it is not clear that the additional labor required for some of the "improved" intensifications will actually be forthcoming in a timely manner. There are related difficulties over labor cost in computing total variable costs, gross margins and benefit/cost ratios. It seems that all labor, including different categories of family labor, is valued at set rates that approximate opportunity costs of full employment outside agriculture (e.g., a rate of Tk.25/day of adult male labor is used at the Hathazari site). If actual opportunity costs of farm family labor are much less than this most of the time, this accounting procedure must understate the actual profitability of all compared CPs, especially the most labor-intensive CPs.

There may be other accounting difficulties in the present analysis of profitability. The most serious one likely concerns credit costs required by most farmers to implement the "most profitable" CPs, especially those involving potatoes and intensive production of HYV rice. Inclusion of realistic costs of such credit would give a more accurate impression of profitability.

Related to the above is the potentially important question of risk associated with hopefully profitable "improved" CPs. The scientific staff working on CSR seem generally sensitive to this issue in their discussions of the work, but their concern is not reflected in Project reports and thus, presumably, in the ultimate stage of formulating recommendations. Proper accounting for risk is admittedly not an easy task, but it does seem that some pragmatic procedures are required to bring explicit attention to this matter of such concern to target farmers in their adoptive decisions. One suggestion is to report data recorded for the least favorable on-farm results, in addition to the presently tabulated sample mean cost, yield and return data.

In mentioning the reporting of mean data, it would be helpful to readers of such reports if fewer "significant" digits were reported (e.g., if a number such as 36482 Tk/ha were rounded to 36000 Tk/ha). An indication of sample variation would also be helpful (e.g., including sample coefficients of variation in parentheses after or under the respective mean would be of great informative assistance). Comment should also be made on the circumscribed relevance of benefit/cost ratios as computed in CSR reports. Under diminishing marginal returns, it is such an inadequate criterion for farm planning that it is probably best left unreported. Most of the CSR testing trials are still at an early stage. Investigators, in collaboration, it is hoped, with both farmers and extension workers, must soon enter the intended phase of composing concrete recommendations so that findings of the more advanced CSR can be effectively exploited. There are, however, likely to be some further difficulties in this phase that have their origins in the foundation of the CSR programs. It seems that site selection has been primarily on the basis of ease of access for scientific staff and visiting farmers (and other agricultural tourists such as Evaluation Teams). Thus, in terms of relevance to more remote, backward and difficult areas, this calls into question the social responsibility aspect of this form of FSR. The problem is exacerbated by the careful selection of cooperating farmers for the on-farm trials in terms of their cooperativeness rather than their representativeness. While it is important that a start has been made somewhere, it is hoped that subsequent extension of CSR work will be in a direction that will correct the present bias towards more favored locations and situations. These suggestions are not inconsistent with Harwood's (1982) suggestions for BARC site-certification of FSR sites, and for closer linkages with the extension service.

Involvement of extension personnel in the process--from selecting the on-farm trial sites, planning and implementing the initial on-farm trials, modifying the program in line with findings and subsequent extending to the broader farming community--is the exception rather than the rule. It has been used most effectively in the MCC sites and, to a lesser extent, in Ishurdi.

The crops selected at the regional stations for on-farm CP tests seem appropriate for the respective areas. The Cropping Patterns, to the extent that they have been tested in on-farm trials, seem to have been appropriate. However, they are and should be subject to modification as findings indicate the necessity to do so.

Work is proceeding with introducing "new" crops, such as maize, summer pulses, and vegetables. This should continue. Rice is the staple food; maize is eaten by some people as roasting ears and for poultry feed. These purposes will have a limited market demand for at least an initial period since eating habits and food preferences change slowly. Extension and research must be cognizant of the effective demand and balance this with their encouraging farmers to increase production of the new crops. The emphasis should not be totally on the production/yield potential. A common complaint at all locations was the inability to analyze the data collected due to the personnel shortage and, by implication, competence to do so. At all locations it was felt that a mini-computer would solve this problem, but few had focused on the need for and source of competence for computer programming, data analysis, and interpretation. Another problem would be the extreme fluctuations of voltage and regular periods without power. The most appropriate solution would be to reduce the mass of data and focus on the most relevant types of data for site selection, cropping-system performance, and research system and farmer feedback.

The practice of providing free inputs, such as improved seed, fertilizer, insecticides, etc. presents a potential problem when cooperating farmers subsequently have to purchase them. Because Cropping Patterns have not yet been extended to other farmers, it is unknown whether this problem will, in fact, arise. It would not be unusual for the surrounding farmers to expect, and possibly demand free, inputs like the cooperating farmers received. Regardless, it is essential that the Project and scientists bear in mind that implementation of the new interventions by the farmers will not occur unless the resource demands are reasonably within the farmers' economic, social, physical, and other resource limitations.

The most important test of any cropping is whether it is being adopted. Thus, CSR workers should periodically monitor the area around their sites to find out if farmers know about the new cropping systems, if they have adopted these new systems and, if not, why. This information does not require a detailed questionnaire. It should be quickly tabulated at the site, sent back to headquarters, and used for redesigning the next year's experiments. At the time of this evaluation, many site personnel did not know whether anyone was adopting the new systems.

Problems and Constraints

The CSR represents one of the most highly coordinated achievements of the Project. The trials have been effectively coordinated in terms of procedures and style of operation across the participating institutions (BARI, BJRI, BWDB, BAU, SRI, MCC) with the exception of BIRRI. Even here, however, there is a degree of coordination because of the approach adopted, which stems, no doubt, from the apparently common roots of the CSR programs in the IIRI tradition.

On closer inspection, however, perhaps the degree of coordination achieved is not completely desirable. This question can be broached under four considerations:

- (a) uniformity vs diversity: FSR is not an agreed on approach in terms of the particular methods that might best be employed; thus, the rather uniform approach to CSR that has been "coordinated" or otherwise imposed does not provide much opportunity for discovering advantages of alternative procedures.
- (b) duplication vs parallel development: to the outsider, it seems much of the same sort of CSR work is going on. This impression of "coordinated duplication" must, of course, be tempered by the degree to which there is systematic coverage of the major agro-ecological zones of the country (especially in terms of flooding depth, soil type, and farming system), but the team was not persuaded of this latter virtue.
- (c) analytical vs encyclopedic research: perhaps reflecting the still-early stage of the work, the present emphasis on accumulating data rather than on testing hypotheses does not give a strong impression of science in action. The impression is more of a series of ad hoc fertilizer cum variety trials without formal controls or unconfounded component effects. The feedback loop between benchmark survey data to technology design seemed generally absent, as was that between trial results back to component tests.
- (d) centralized vs decentralized interpretation: related to the foregoing considerations is the extent of responsibility for those actively engaged in the CSR field programs. The situation varies from site to site but there is a tendency for those closest to the data (the site coordinator agronomist and, where in place, the socio-economist) to receive the plans; to conduct the surveys trials and summaries (with vigor); and then to hand over the "results" for consolidated reporting

without the analytical attention mentioned in (c). It would be healthy for these regional staff to take on more of a scientific role in interpretation, design, hypothesis testing, etc. and thus preserve more of a proprietary interest in the work.

Again the main exception is MCC in Noakhali and Comilla, the one place where CSR has led to actual recommendations being made.

The Team was concerned that each CSR experience seems to be described and discussed in isolation from other previous and contemporary experiences and, most distressingly, from previous FSR. It seems as if literature pertinent to the work of the scientists engaged is not readily available. Library resources, in the FSR field especially, must be built up, and access to these resources must be facilitated for all involved research staff.

Minimally, all FSR site offices should be supplied with a copy of the (USAID sponsored) review of FSR,* as a low-cost but fairly comprehensive entry to the world literature. Desirably, BARC (at least) should have an active subscription to and retrospective holding of the journal Agricultural Systems through which it is hoped that Bangladesh scientists will eventually submit their FSR work to international scrutiny.

Recommendations

The Team believes that the orientation to conducting research on farmers' fields with the active involvement of farmers in the management of the trials is commendable for its enhancement of relevance of scientists' activities, for predisposing relevance of experimental conditions, and for easing the two-way transmission of information between research workers and farmers. However, it recommends that the scope of the CSR work be broadened to encompass wider FSR considerations, be strengthened to enable more explicit testing of hypotheses, and be interpreted to emphasize adaptive feedback to research planning and determination of priorities in future work.

Persuant to these general suggestions, the Team makes the following several recommendations:

* Shaner, W.W.; Philipp, P.F.; and Schmehl, W.R. Farming Systems Research and Development: Guidelines for Developing Countries. Westview, Boulder, 1982.

- 1) There should be more integration of the Cropping Research Program with the work of scientists on the regional stations or at Joydebpur. The results of the cropping systems trials and other surveys such as the proposed adoption surveys, which focus on constraints to adoption, should be written up quickly and reported to scientists concerned with these crops. The constraints that are identified should then be the basis of further on-station work. The IADS Specialists can play an important role in improving this communication process.
- 2) Training of FSR workers at all levels should be activated, especially for the "scientific" staff, including socio-economists. Training should include field trips to some of the more advanced CSR sites, such as the MCC sites in Noakhali and Comilla. As their skills increase, more of the research design and data analysis can be done on site.
- 3) To the extent that training is done overseas, some institutions should be selected partly for their differences from the prevailing IRRI approach (e.g., University of Reading, Lincoln College, CIMMYT, Colorado State University).
- 4) Participating institutes should move to ensure that all FSR projects are staffed by at least one economist, as well as by an agronomist. More formal economic modelling should be undertaken to extend the analysis of the emerging CSR data (e.g., farm planning models to orchestrate efficient whole-farm resource allocation). This may require some short-term consultancies as well as an appropriately interested second Specialist appointment in agricultural economics.
- 5) Reduction in the amount and simplification of data collection to digestible levels will save considerable time and improve utilization. The existing farm/plot size, cropping patterns and intensity, production inputs and practices, source and quantity of water, amount and source of labor and farm power, financial situation and/or access to credit, and positive and negative social aspects should be adequate initially. Expansion and refinement of data collection should be initiated later as the human resources, equipment and/or competence to analyze and utilize the data are available. The Team noted with interest the observation of Dr. Barker in his consultancy report: "Everywhere the tendency has been to collect too much data without thinking through the objectives and analysis. We at IRRI have been as guilty as everyone else on this score."

- 6) Extension agents should be involved in designing the trials, monitoring the results, and monitoring the adoption of the new technologies.

2.4 ECONOMICS AND SOCIAL SCIENCE

The Project Paper is not very clear about intended achievements in the fields of Economics and Social Science (ESS). On p.6 it endorses the 1980 report of the joint GOB/AID/IBRD review team, which states: "Agricultural economics and social sciences must be more fully involved in problem diagnosis, planning research, monitoring and interpreting results relevant to farm conditions." The contract specifies that the agricultural economists will train local staff, organize a central unit to process and analyze data, and "advise on socio-economic criteria relevant to research activities and priorities." They will do "analysis of the issues related to appropriate technology and employment of landless and marginal farmers as well as women and family members." They will also "design and execute surveys on farm practices, problems, employment opportunities, and division of labor" (Contract, Appendix A, p.8).

Progress

The major achievements in the ESS area include: (a) the initiation of Contract Research Projects, (b) teaching short courses on descriptive statistics for people working with farming systems, (c) selection of candidates for Doctoral and Masters degrees, (d) assisting anthropologist Dr. Wallace to initiate his research, and (e) bringing in Dr. Barker (Cornell) as a consultant.

The major topics chosen for contract research were important ones for small farmers--technology assessments of wheat, maize, potatoes and other tubers; cropping systems; and irrigation management. The initial Project Proposals were not impressive. Recently, the application forms and selection procedures for new projects have been greatly improved. The IADS Specialists have helped integrate the ESS cropping systems research program with the Crops cropping systems research program. Dr. Greene has been upgrading the statistical skills of the scientists at the sites and is now starting to work on their economics skills. If successful, he will have made an important contribution to CSR because the staff will have a better understanding of what they are doing and will take more pride in their work. Finally, the regular visits of Dr. Manzano and Dr. Greene to the sites allow them to identify weaknesses in design of field work and encourage the staff to improve their methods.

Since Dr. Gisselquist arrived, the role of BARC in the Water Management area has increased. He has submitted several proposals to the Member Directors, which would further strengthen BARC's role in this area. These include funding for a bibliography, staff support, and library facilities. The role of the Specialists is discussed in more detail in Section 2.8.

Issues

Social science research is useful if it helps scientists allocate research resources more effectively, helps farmers allocate their resources more efficiently, or helps policy makers develop more effective policies. The closest ties at present are with other scientists. At BARI and BRRI, agricultural economists do discuss their plans and results with other scientists. However, they seem to have little impact on the plans of other agricultural scientists.

The agricultural economists of the BARC group of institutions do not appear to be closely linked to policy makers. The Team did not see any policy studies for the Ministry of Agriculture. This is probably due to the fact that these institutes simply do not have sufficient well-trained social scientists.

The linkage with farmers is also weak. Most BARC-related social scientists are located in Dhaka and Joydebpur. They go out occasionally to interview farmers. The only social scientists in branch stations of BARC institutions seem to be the economists associated with cropping systems work. However, the regional economists did not seem to be developing close contacts with farmers. On one CSR site the economist did not know if any farmers had adopted the new patterns. They understand little about the potential of cropping systems for solving farmers' problems. Also, they seem to play little role in developing the regional stations' research program.

A number of major issues have been ignored by BARC. One role that ARP II proposed to support was to use economic analysis to help plan research through assessing the distribution of benefits and determining the efficient allocation of research resources. The first Internal Review recommended that BARC accelerate studies on returns to research. However, BARC has done little in this area during the grant period. Other issues of major importance have been proposed by various teams, but so far BARC has not been able to respond. The 1980 GOB/USAID/IBRD Team and Cushing (1983) emphasize the importance of rural employment and the landless, and it is also explicitly mentioned in the ARP II Contract. The 1982 Internal Review and consultant Dr. Barker recommended that BARC support more research on price policy.

BARC's only activity in this area is Dr. Ahsan's research on fertilizer with IFDC. Much of the data that are being collected at the farming systems sites could be used to deal with policy questions, but they have not been so used.

Technical assistance may not have been ideally used thus far. Dr. Greene is currently doing useful work. Many Bangladeshi scientists can profitably use a course in descriptive statistics. It is a necessary step that should enable the cropping systems sites to operate more effectively. However, as Dr. Barker stated in his report, "the major constraint to agricultural economics research in Bangladesh today is the ability to decide what questions to analyze" (p. 9). It is in this area that the expatriate economists should be able to make their greatest contribution. They can help develop this ability in Bangladeshi social scientists through joint research projects, assisting in the preparation and review of research proposals, and through short courses on research methods. If they choose to do short courses, the emphasis should be on identifying important questions, developing them into testable hypotheses, and then testing them.

Dr. Wallace seems to be an inexpensive bonus for the Project. He has an interesting research program, which should help broaden the CSR and also put the Project in touch with social scientists other than agricultural economists. The second agricultural economist has not yet been hired. IADS has not been able to come up with an acceptable candidate.

The contract research also does not appear to have been well used. In preparing the research proposals, scientists should have identified important topics, reviewed the literature, and decided on the best procedures for testing the hypotheses. There is little evidence that this was done in the first 10 IDA and USAID Contract Research Projects. However, if social scientists utilize the new forms in the "Yellow Book," they will have to deal with these issues in the future.

The titles of the USAID financed projects illustrate the lack of precision that runs throughout the proposals, i.e., "The Economics of Irrigation in Bangladesh" or "Socio-Economic Research on Jute Farming in Bangladesh." The proposals themselves are equally vague and unrealistic about what can be accomplished in two years with \$20,000. The the result has been the Team's observation that, in CSR, agricultural economists are compiling mounds of data that are not being used to answer important questions. These data could be used to help guide research planning or-estaticn, to assess the impact of new technology, and to answer some price policy questions, but this is yet to happen.

The contract research has made a limited contribution to the integration of the research system. The grants were given out to a small number of institutions and these institutions do not include most of the top social scientists in Bangladesh. The 10 projects were divided among five principal investigators at five institutions. The cropping systems projects brought BJRI, BARI, and BWDB closer together, but there was little other integrating effect. About \$120,000, or 44% of the total IDA and USAID financed contract research in ESS, was given to BARI. No grants were given to BAU, which has a strong economics faculty, or to BIDS, Dhaka University, Chittagong University, or Rajshahi University. All of these institutions have active research programs in ESS and should not have been neglected, as seems to have been the case.

By April 1983, ESS has only been able to spend 26% of its total scheduled expenditure. The major shortfalls are in Specialists' salaries and commodities (especially the computers). Degree training, though way behind, will solve itself now that candidates have been selected and have started to depart in May 1983. The commodities problem can be solved relatively quickly if the problem of customs duties is settled. The problem of the Specialists' salary exists because the second agricultural economist has not been hired. Consultants have not been much used, in part, because BARC cannot get government approval.

Constraints to Progress

The social scientists working on agriculture are scattered through a wider range of institutions than are other agricultural scientists. Almost all agronomists work in the BARC group of institutions, but most of the best rural social scientists are outside the BARC group. An additional complication is the split that exists between agricultural and nonagricultural social scientists. In agronomy, virtually everyone studied at the same institution (BAU or the Agricultural College). In social sciences they come from more diverse institutional backgrounds. Thus, promoting cooperation and communication among social scientists seems, in the Bangladesh context, to be much more difficult than in other sciences.

A second constraint is the inability of IADS to recruit acceptable candidates for the second agricultural economist position and the two water management positions. This means that Dr. Greene must do a considerable amount of work with BARI people and Dr. Gisselquist has to spend much of his time on the non-economic aspects of water management.

A third constraint is the shortage of well-trained agricultural economists within the BARC group of institutions. At present, the only Ph.D. agricultural economists are located at

BARI, BARC, and BAU. Because the Jute Research Institute does not even have an agricultural economics section, agronomists are trying to do the necessary analysis. Most regional stations and substations also do not have any agricultural economists.

A fourth problem has been the reluctance of GOB to approve some nominated consultants.

Recommendations

In keeping with the needful completion of the panel of Member Directors, the Member Director for Social Sciences should devote full time to developing the social sciences. This is an extremely important area. Social Scientists are widely scattered throughout the country and improving communication could be very important in preventing needless duplication of research and stimulating more research of higher quality.

The Team also recommends that IADS make greater efforts to recruit qualified people for the economics and water management positions.

BARC should make better use of the economic skills of the Agricultural Economist Specialist. The Team suggests that he should be spending more time trying to develop the economic analytical ability of Bangladeshi scientists and less on teaching them statistics. The statistics might be turned over to an organization such as the Rural Development Academy Bogra, the Graduate Training Institute at BAU, or the Institute of Statistical Research and Training, Dhaka.

The Team recommends that BARC should try to encourage communications between agricultural economists in the BARC group and social scientists at BIDS and the general universities. This could be accomplished through seminars, improved bibliographic and professional literature services, contract research, and membership on the technical advisory committees.

The Team recommends that BARC try to bring the social scientists from outside the BARC group into contact with agricultural scientists (who are not social scientists). This could be done through sabbaticals, seminars, short-term training, and contract research.

The Team suggests that BARC should broaden the range of research topics that it supports. It should work toward more social science participation in planning research through *ex post* and *ex ante* analysis of research investments and their impacts on various groups. BARC needs to encourage more research on the impact of new technology on the landless, women, and marginal farmers. Studies on the diffusion of innovations are another largely untouched area.

The Team suggests that BARC encourage more social scientists to spend sabbaticals at BARC institutions as Dr. Wallace has done.

2.5 CROPS RESEARCH

The purpose of the Crops Research Program is to strengthen the crops research capacity and then apply this to increasing the productivity of selected food crops, generate new crop varieties, and develop cropping-systems' technologies that will fit into small farmer agricultural systems.

Achievement is to be measured by four outputs:

- (1) an increase in the manpower available to do basic crops research;
- (2) an operational program of multi-disciplinary research, which integrates soil, water, socio-economic, pest and weed management factors with crops research;
- (3) studies that have considered the role of women in cropping systems for vegetable and root-crop production, post-harvest technology and marketing; and
- (4) sets of crop production technologies that are available for testing in a farming-systems program.

The Project Paper has identified many of the constraints facing Bangladesh's agriculture that might be relieved by a vigorous Crops Research Program, including the shortage of improved crop varieties and suboptimal cultural practices (particularly of non-rice crops). There is also an extreme shortage of trained researchers while existing programs are hampered by shortages of operational funds, seeds, fertilizer, and, in some cases, staff.

Progress

This program has been quite successful in its promotion of research on a number of neglected crops. These include millets (cheena and kaon), pulses, root crops (especially aroids and sweet potato), and maize. Taken together, these crops are an extremely important source of food, particularly for Bangladesh's poor. The pulses supply a major source of protein, root crops provide calories, and the millets are grown in drought years when no other foodgrains are available.

Specific accomplishments include the work on pulses, financed by USAID, IDA, and IDRC, which has produced several varieties that are used in the summer; these have been released to farmers and now cover as much as 16,000 ha. Kheshari germplasm has been collected, and selection is now underway to improve this

most important winter pulse. Of particular interest is the identification of eight kheshari lines that do not contain the lathyrism-causing toxin. Other characteristics of these varieties are being assessed, and it is hoped that some will be available for release in the near future.

Groundnut, sesame and safflower germplasm have also been collected from abroad. These are in various stages of testing.

Technical assistance: The Crops program is slightly behind schedule in the provision of Technical Assistance Specialists. Dr. Kaul was the first Specialist in this program, taking his position in August 1982. The Agronomist position was filled by Dr. Frazier in November 1982. Candidates are currently being sought for the Horticulture position.

Crop-breeding activities are being supported by several donors. This requires that the Crops Specialist spend a large part of his time doing planning, coordination, and evaluation. This has resulted in several papers (co-authored with Dr. Rahman), including "The Barind Area Development Scheme," which projects the steps and activities required for the initial three years and is now under review by the government, and "A Strategy for Crop Diversification in Bangladesh."

Consultants: Very little use has been made of short-term consultants for which funds are provided.

Training: Almost all of the funding for training remains to be spent. A number of candidates for degree training have now been selected and await placement at appropriate graduate training institutions. There have been in-country training courses for farmers on rice production and for extension agents on potato and vegetable production.

Constraints

The most critical area of crops research in which there is a shortage of trained research manpower is in crop production disciplines, such as agronomy. By comparison, plant breeding is relatively rich in appropriately trained scientists. In all areas, however, there has been a general difficulty arising from a lack of practical orientation and the difficulty in getting some scientists out into the field so they can get firsthand experience of the farmers' problems.

On-station facilities were established as part of the ARP I Project. Some of the work remains incomplete and is hampering the crops research activities. It appeared, for example, that the land leveling at the BARI Central Station had not been done properly. Topsoil was apparently not pushed aside before the

leveling began, instead being used as part of the fill for low spots, leaving large areas of exposed subsoil inappropriate for use in the crops research activities. It will take time to correct the deficiencies. The Jamalpur Regional Station lacks funds to complete its leveling activities.

A number of other constraints exist within the Crops program. There are too few trained personnel, new germplasm is needed, planting materials are in short supply, there is not enough fertilizer, and operational funds limit the amount of field work that can be done. (The Team notes with considerable pleasure the May 1983 decision to allow the use of some PL 480 funds for operational budgets. The Specialists prepared the bulk of the backup data on the areas and types of requirements, and participated in designing a system for distribution of the funds.) The highly centralized system of planning and funding is also seen as a constraint to progress as it frequently delays decisions and resources that are required to get experiments planted in the fields at the proper time.

The problems of customs duties and taxes have delayed the importation of commodities needed in this program. A prompt solution is needed.

Some further problems relate to the deployment of Specialist staff. These are discussed in Section 4.1.

Recommendations

Crops research progresses in almost direct proportion to the quality and quantity of the germplasm it collects and uses in varietal trials. Such collections should include both indigenous materials and the introduction of materials from outside Bangladesh. Some plant collecting has been done, and materials are being moved through the quarantine process. A much more active and systematic effort is required if the full benefits of this program are to be realized.

A more systematic breeding program seems to be needed. Particular sources of lines and germplasm, problems, etc. have been identified, but the Team recommends that crops researchers use a more systematic program to develop, screen, and release varieties. Continuing and increasing attention should be given to varietal production trials and improved Cropping Patterns of groundnuts, maize, millets, barley, root crops, and fast-maturing pulses.

Another area that deserves study by BARC is the production of foundation seed by the research system, and the most effective ways of multiplying and distributing seed once it has been released.

The Barind area is regularly subject to drought conditions, but generally permits one crop of T. Aman rice from July to November. During the balance of the year, the area lies fallow and suffers erosion. This makes it one of the poorest sections of the country. If funds are available, the Team suggests that IADS Specialists could assist in the planning of a Barind research program. The establishment of a station in a representative area may be needed to collect relevant data and test preliminary suggestions for intervention. ICRISAT and the Indian Dry Land Project (ICAR) may be good sources of assistance for designing a program, for identifying plant materials, cropping patterns, farming systems, and related research and extension activities.

The Specialists could also assist in the development of a similar program in the saline and mangrove areas of the country. This research program would study such crops as rice, wheat, mustard, millets, barley, and lathyrus. The potential exists for increasing food production and employment from greater exploitation of the dry and saline areas.

The Farming Systems Program is beginning to obtain results from the Cropping Pattern trials on farmers' fields. This program will produce important information on new varieties, cropping intensification and diversification, and the performance of Cropping Patterns on farmers' fields under farmers' management. These results should be used in the Crops Research Program.

2.6 LIVESTOCK

Allocation of available funds toward livestock research has been remarkably small, even in comparison with other neglected areas noted herein and, in this sense, parallels the priority hitherto attached to such work in the national research portfolio.

The importance of livestock in the agricultural economy of Bangladesh (especially for draught power and milk and meats for high-quality proteins) is well-recorded in several Project documents and does not need to be reiterated here. The general neglect of this important component of agriculture is most regrettable. It is paralleled by the above-noted lack of emphasis given to livestock and fisheries interrelationships with crops in the Farming Systems Research work program presently underway.

This is not to say that nothing has been done or achieved in the fields of animal science and livestock improvement. Useful work has been done by both domestic researchers (e.g., at BAU) and foreign agencies (e.g., in the Australian, Danish, and West German livestock-oriented programs). BARC, however, has yet to play much of a role in leadership and coordination in this

regard. A good starting point would be the appointment of the relevant Member Director and the preparation of an inventory of livestock research, of the type done for fisheries.

Progress

The only recent activities have been the National Seminar on Fisheries Research (September 1982) involving release of Tk. (36,000), one research contract with Chittagong University on giant prawn seed technology (Tk.129,000), and a one-month consultancy on livestock research by Dr. T.R. Preston (February-March 1983).

A most valuable achievement of BARC in preparation for the National Seminar was the publication of the "Inventory on Present Status of Fisheries Research in Bangladesh."

Plans

The consultancy report of Dr. Preston became available to the Team during its visit. It is still only a draft proforma for project evaluation for the World Bank proposed Phase II Agricultural Research Project and has not yet been considered or in any way acted upon by BARC. Some comments on it, however, seem warranted. It sets out a research program to be executed in 1984-1988 by the proposed Bangladesh Livestock Research Institute (BLRI) designated to be located at the Savar Cattle Breeding Centre.

It is directed at increasing livestock, energy, and fish production through an integrated family farm system. This will feature future development of feeding systems based on crops residues (e.g., through urea and alkaline amendments), increasing the availability and efficiency of animal draught power, and involve development of biogas digestors and of methods of using the effluent for fertilizer and feed, especially for fish. It is also suggested that there be an attempt to diversify the exploitation of sugar by-products for animal feed and fuel, although this aspect seems of limited potential, of applicability only in areas close to sugar mills.

As far as the Project is concerned, it is to be hoped that the position for a Livestock Specialist can be activated so that due attention to livestock can then be directed into the Farming Systems Research.

2.7 SOIL MANAGEMENT

The purpose of the Soil Management Program is to develop a multi-disciplinary research activity that will contribute to the

management of on-farm soils. Particularly, it is intended to address the poor crop response to fertilizer and the inadequate fertility management programs used by many small farmers that have been seen as limitations to increasing crop yields.

Cushing (1982, pp. 40-41) gives a good overview of the activities that are appropriate to this component. His recommendation is that the Portch (1982) Report should be used to carry out these activities.

Progress

Dr. Portch arrived in December 1982 to supply the technical assistance to this program.

There are four phases, which he has identified as activities for this program:

- (a) definition of an appropriate sampling program;
- (b) establishment of a central service laboratory that can analyze soil and plant materials;
- (c) development of a base of crop-response information, through laboratory, greenhouse and field studies, on which interpretations may be based; and
- (d) production of recommendations to the farmers that are consistent with their capabilities.

The first phase of this program is well underway and should soon be completed satisfactorily.

The second phase, that of establishing a central soil- and plant-testing laboratory, is incomplete due to the need for laboratory renovation, purchase of additional equipment and the proper installation of some existing equipment. The commodity purchases are likely the most serious constraint since the customs duty issue has not even allowed them to be ordered. When the laboratory is complete and equipped, there should be no serious difficulty getting an adequately large central laboratory in full operation to handle the analysis of farm materials from the entire country. The personnel available to do this seem to be competent and motivated to provide this service function. This is a new type of activity and the willingness of the staff to take on such an important service function is commended.

Some initial work has been started on the third phase, which will develop the interpretive base for using the soil and plant nutrient information. Pot experiments are being carried out as part of the Contract Research System, as well as field trials on experiment station and on-farm plots.

The program recognizes that it is important to be able to use the recommendations as soon as they are developed. Their plan is to make a draft of a recommendation available to the concerned scientists, including economists, and then revise it in light of their suggestions. A workshop would then be organized with the District Extension Directors, who would then disperse the findings to their extension staffs.

Although this conceptual design has been adopted for the fourth phase, which will produce recommendations for farm management, no specific results have yet been run through this system.

Technical assistance: Dr. Portch is well-qualified to assist in the development of this program area. Several other specialists also have soil management training and can supplement his activities as necessary; local counterparts appear to be well-prepared to do the required work.

Consultants: Mr. Clayton was used recently (April-May 1983) in a very timely and cost-effective manner to repair scientific equipment at BARI and many of its stations. Some training of local personnel was also done. This is a highly commended activity that is clearly still urgently required in several laboratories and the Team recommends that moves be made to recruit the Specialist in this field as soon as possible. The further recent consultancy by Dr. Fitts (Florida) has been useful in preparing a reconfirmed detailed plan of action.

Training: The training activities of this program area are relatively minor. The cadre of existing personnel are well-trained to carry out most of the soil management work. Plans to do some short-term training to gain specific analytical skills seem justified. Implementation of these training plans appears to be about as far along as the system will allow.

Contract research: Much of the development of interpretive information will come from contract research. This is a good way to get broad involvement throughout the country and to more fully utilize the scientific manpower that is available.

Commodities: A soil- and plant-testing laboratory that can analyze a large volume of samples on a routine basis is fundamental to a number of programs being carried out under the IADS contract. Other analysis facilities in the country, while similar in scope, are not adequate to handle the required volume of samples. In any case, a certain amount of redundancy is important for cross-calibration purposes.

One example of redundancy, which may not be necessary, is to be found in the BARI regional soils laboratories. For example, the Comilla substation has a soil-testing laboratory that is in

deplorable condition. This laboratory will not function to any appreciable extent until basic facilities are provided, such as a generator for reliable power. Some upgrading is underway with the addition of new analysis equipment and air conditioning. Given its small scientific staff, such expenditures will not be effective for some time.

Constraints to Progress

The role of a central laboratory versus a regional network for performing routine soil analyses seems not generally understood in Bangladesh. The capabilities appropriate to the regional stations need clarification and realistic implementation plans adopted, including ways to mesh their activities to the central laboratory. Likewise, the resources of BIRRI and perhaps other institutes should be examined carefully to assure that the national needs will be met, but not unnecessarily overbuilt. Until this is done, it is likely that the personnel working within the system will not have a clear idea of their role or of how to get their work done effectively.

Commodity procurement restrictions are presently blocking progress; this is a serious constraint. Some flexibility is also needed to allow local procurement, especially those items that are needed quickly to keep the analysis system operational. Items needing frequent repair, for which local service is available, also fit this category.

The lack of operating funds at the experimental stations is blocking some of the studies that are needed to provide interpretive results. Greenhouse facilities are also generally lacking, further compounding this problem.

There is some lack of overall design in the field trials that may limit the usefulness of some of the experiments and delay the interpretation of the soil and plant information. This is a complex problem, for there seems to be a lack of unanimity on which experiments have highest priority. It will likely remain a constraint until a more systematic body of reliable knowledge is available and thoroughly reviewed.

Economic evaluation studies are not explicitly identified in the Portch (1982) Report. Yet these are important in the larger evaluation process, as the results are applied to farmers' problems. Application of the results of this program is likely to be constrained until fertility data are integrated with economic analysis. It is not sufficient to wait until the fertility research is complete. Rather, it is important to use these data to guide the research itself.

The Farming Systems studies provide natural links between the fertility research, farmers' constraints, and economic

studies. While there is a clear potential linkage between these activities, there is no sign that operational links yet exist. For example, what benchmark data have so far been used to adapt the cropping systems design to recognize the economic constraints of the farmer relative to fertilizer levels? It is anticipated that such analyses might call for a shift in attention to additional research, such as studies on biological nitrogen fixation as a way to supplement fertilizer inputs. Obviously, such feedback comes after the Farming Systems Research has become more mature. But it is not too soon to be looking for such relationships between research results and research planning.

Recommendation

The Team recommends that development of the service facilities for a central laboratory should receive high priority. This laboratory will require some time to become fully operational and build a service-oriented routine. Attention should be given to the prompt return of analytical results to the field personnel so that they develop confidence in the two-way flow of the system and are better able to see their role in the soil fertility activities.

Interpretation experiments need to be assessed carefully so that the priority tests are accommodated first. Success in this should lend credibility to the entire process and stimulate high-quality follow-up studies. There is some danger of duplication in such studies; this would be unfortunate, given the overall shortage of trained personnel, facilities, and operational funds.

Early trials should be made that transfer research results into recommendations for farmers. This, too, will add to confidence in the feasibility of the system.

2.8 WATER MANAGEMENT

The irrigated area in Bangladesh has doubled over the past 20 years and there is every indication that it will double again in the next 20 years. The groundwater resources are plentiful, and the provision of water during the dry season has promoted multiple cropping in areas where it was not previously possible. With the intensification of irrigation, there is a substantial need to provide for the efficient development of these systems; past activities can best be described as somewhat haphazard. For example, pumps are commonly found to be operating significantly below their rating and there is frequently a mismatch between the pump and motor capacities. Even slight unit improvements should have an overall large impact, given the number of irrigation projects in the country.

The Water Management Program involves a combination of engineering and social science research to improve the efficiency of the on-farm Water Management System (Project Paper Amendment, p. 3; Project Paper, p.19). Research will be done on small scale systems, which typically consist of wells, short distribution systems and relatively small command area.

This is a large, complex activity, which involves the participation of a number of government agencies. Unfortunately, there is no historical precedent for integrating the various agency activities in Bangladesh, and so linkages have to be forged by this program. Cushing (1982, p. 43) has noted that this "offers an opportunity for BARC to assert its leadership in defining problems, setting priorities and coordinating the work of the agencies that will be involved in setting them."

The Water Management Program began as one of the large programs of ARP II. It was greatly enlarged by the funds added with the 1982 Amendment so that it now comprises more than 25% of the entire ARP II Program. The Water Management Program includes a particularly large allocation for contract research.

Water Management forms a multi-disciplinary program. It is planned to include activities that range across the disciplines of Soil and Water, Economics and Social Science, Crops and Farming Systems, Agricultural Engineering, and Livestock and Fisheries.

Progress

The activities in the Water Management Program have had a slow and uneven start. At best, they can only now be seen to be in the early formative stages.

The Water Resources Specialist (Dr. Gerards) resigned from the Project in April after eight months of duty. Dr. Gisselquist took the position of Water Management Extension Specialist in December 1982. The third Specialist position, Agricultural Engineer, is under recruitment and this Specialist will be on duty by September 1983. The vacated Water Resources Specialist position is under recruitment.

A set of contract research activities was begun in July 1980. Some 22 projects were initiated at that time that have relevance to Water Management, with six of these receiving funds from USAID, and the remainder supported by IDA. Virtually all of these Contract Research Projects are scheduled to end in June 1983.

Dr. Russell was brought in to help the development of the first round of contract research proposals. Dr. Levine and Dr. Lowdermilk were engaged as consultants to suggest areas appropriate for further Contract Research Programs.

A "Diagnostic Analysis" training course was organized to perform on-farm analyses of deep-tube well irrigation schemes. This six-week course involved the use of six trainers from Colorado State University and five local co-trainers. Twenty-five trainees participated in the course, which was structured to make the trainees the trainers for subsequent courses. This should spread this expertise so that the country may eventually be supplied with a cadre of skilled people to assist in the development and management of the thana-level irrigation activities. The follow-up program planned for this group of trainers involves a linkage of their program with a similar one that has been used at Bogra (sponsored by FAO). Their combined effort should put them in a good position to build an extensive farmer training program that integrates with the national irrigation management policy.

Other training activities include the planning of courses on tubewell construction activities and pump efficiency. It is anticipated that the Asian Institute of Technology (AIT) will present these courses.

The 10 candidates for Masters Degrees have been selected and their applications are awaiting further processing.

Technical assistance: The large amount of work required to coordinate the many facets of Water Management argues strongly for the three planned Specialists, each representing different disciplinary foci. The activities of the three Specialists will complement each other and help to ensure that a broadly balanced program is carried out. Dr. Gisselquist is taking on the whole load now, quite to his credit.

Consultants: The past consulting activities have made valuable contributions to the general program of contract research. Future consultants are expected to provide more specific input. Dr. Radosovich will be used soon to work with local counterparts to develop recommendations for water resource policy formulation and to hold a number of workshops on relevant topics. Other consultant activities are being discussed but have not been initiated.

Training: The large number of people already trained in some aspect of Water Management and the group of candidates already selected for overseas training should provide a good basis for further in-country research on improved on-farm Water Management. Plans to do training that will reach the farmer level were mentioned earlier as a follow-up linkage of the Diagnostic Analysis course and the activities underway at Bogra. This training could also be made available to cooperatives, private companies and mechanics so that farmers do not have to depend on the government extension system for service and information. If

this effort is supported adequately, with the development of long-term linkages to the country's extension system and with the production of technical materials appropriate to farmers, the research activities are likely to be of considerable practical benefit.

Contract research: An ambitious program of contract research has begun. This appears to be a good way to get more research activity directed at on-farm problems.

Commodities: The specific purchases have not been identified.

Constraints to Progress

The Specialist staff is now at one-third capacity, but should reach full strength later this year. The program that has been budgeted requires these planned disciplinary experts if it is to perform in a coordinated fashion.

Adequate local staffing will remain a central constraint, even under the most optimistic views.

There is a large pool of skilled manpower in the country, and it is important that these people be organized to work in an interdisciplinary effort that investigates priority issues. For example, economists at Rajshahi University have done some very good studies on the economics of STWs, DTWs, and indigenous lifting devices but many of their studies are flawed by the absence of inputs from engineers and agronomists. To do true Water Management research, which is likely to have impact at the on-farm level, will require that some researchers look beyond their disciplinary boundaries to fill missing areas. How successfully this can be done will depend on BARC's ability to move beyond narrow disciplinary and institutional boundaries. If it can do this, for example, by bringing Rajshahi economists together with BADC engineers and BARI agronomists, this project should be successful.

While there is now an explicit mechanism for the identification of research priorities in the contract research process, some proposals, which have passed through the technical review process and are awaiting funding, appear to be well outside the scope of a Water Management Program (although they might be relevant for other research foci). Close adherence to these "Yellow Book" procedures is a necessary step in assuring that the priority research needs are actually investigated with quality research programs.

Recommendations

The division of the contract research funds into disciplinary foci before overall priorities have been set appears to be opposite to the intent to have an integrated program. An element that seems to have been undervalued is a strong irrigation component. This is a common theme among the many components and it should receive funding sufficient for it to serve in an integrating role. Explicit planning activities involving people from the BARC group, Rajshahi University, BUET, and BAU should be initiated to force the integration of the separate contract research activities into an integrated study. This should include the development of a plan that shows how the studies relate to on-farm problems, and how the research results will be disseminated to the farmers.

The recently strengthened contract review process needs to be used on any pending proposals to increase the overall quality of the research that will be done.

Some activities should be initiated that will upgrade the general research resources of the Water Management research community. This includes increasing the availability of literature, improving communication between investigators, and establishing linkages to regional institutions doing related studies.

There is a good opportunity for the effectiveness of the Water Management studies to be increased if they are linked to appropriate Farming Systems sites. The Team recommends that such a possibility be explored.

2.9 PEST MANAGEMENT

Crop protection in Bangladeshi agriculture is at a critical stage in its development as pesticide distribution was privatized in 1980. Private companies are now conducting trials, demonstrations, and extending information about pesticides. BARC and BARI have an opportunity to develop appropriate low-input control measures. If they do not, farmers will have to rely entirely on the companies for information. The purpose of the Pest Management Program is to develop technologies to protect field crops against pests and diseases, particularly those that result in substantial food losses.

Cushing (1982, pp. 43-44) indicates that an integrated Pest Management scheme should be developed that combines the use of toxicants, habitat control, control of alternative hosts, and environmental control as a way to reduce crop losses.

Progress

Pest Management activities began in ARP I (November 1978) and have continued into ARP II. The entire emphasis has been on vertebrate pest management. A primary objective of this work has been to increase the research capability in vertebrate pest management. This includes the development of an indigenous capability to assess crop losses and devise appropriate control strategies. A laboratory has been developed at BARI/Joydebpur, which is staffed with specialists assigned from the Denver Wildlife Research Center and local counterparts.

The specific goals of the program (First Internal Review, 1982) are to:

- (a) establish an ongoing research capability,
- (b) develop damage assessment methodologies and initiate national damage assessment,
- (c) gain an understanding of vertebrate pest species,
- (d) evaluate traditional pest management strategies,
- (e) coordinate program activities with other organizations and institutions, and
- (f) develop integrated control programs.

Rodents are responsible for a significant loss of grain crops but farmers have not had an effective technology available to them to control such losses. Research activities have identified an inexpensive and more effective rodent bait that is acceptable to farmers. A local production capability has been developed to produce that bait supply. In many ways, the Team sees that the development of the Rodent Control Bait Program is a model of what actually can be done to improve the situation of the farmer. A technology was adapted and tested under local conditions, then built into the local infrastructure so that its benefits continue to be available to farmers. Promotion and education have been included in this program as well, providing the farmers with choices of rodent control strategies.

The progress in ARP II has included additional studies on wheat crops, particularly relating to rodent damage assessment, the standardization of baits and their use to control rodents, and reducing bird damage with chemical controls.

Ongoing studies include the determination of farmers' food storage losses due to rodents; bird damage to maize, wheat, and rice crops; and further development of inexpensive rodenticides. Some extension activities are underway, including workshops for extension personnel in damage assessment methods. Several students have already been trained abroad and several others are still working on graduate degrees. It is expected that this will result in a gradual phase-over to a local staff during the next several years. These researchers should then be able to support a continuing program of vertebrate pest assessment and control.

Linkages are being developed between the vertebrate pest program and other institutes. An example is the participation of a pest management specialist from BIRRI working with this program on all rice-related studies.

Studies on the use of chemicals to control birds eating sprouting wheat seedlings looks promising. It is likely that this will be a safe, effective, and inexpensive way to protect wheat crops for a period during which they are susceptible to bird attack.

The bird control work in maize is likely to be important, although it is not clear that a safe and effective technology can be developed for use by relatively unsophisticated farmers.

The entomological and plant pathology parts of this project have not begun; they too are expected to constitute a significant contribution if appropriate control technologies can be developed. For example, early reports from farming system surveys indicate that it is not just the lack of capital that prevents many farmers from using insecticides, but that many farmers neither recognize the signs of insect damage nor know of appropriate control methods that will prevent such losses. This indicates considerable potential benefits of such studies.

Some insect pest work is being done in the farming systems studies where crops are being selected for their short field duration. This is an attempt to limit the period during which insects are particularly damaging. In particular, mustard crops are being protected from aphids in this way.

Technical assistance: Dr. Brooks is the Vertebrate Specialist directing the present activities. He is well-versed in a broad range of vertebrate disciplines and brings considerable regional experience to this position. He is given strong backup support by the Denver Wildlife Research Center. The local staff is becoming adept at the design and implementation of experiments and survey programs.

The Plant Pathology position has been approved by BARC recently, and IADS is beginning the recruitment process. The Entomology position is still awaiting approval. It is expected that these two specialists will be attached to BARI where they will work with counterpart staff, developing the Pest Management Programs.

Training: A number of radio programs and a 30-minute television program were broadcast on vertebrate damage and control methods. Slide presentations have been given to institute staff, extension and farmers groups.

Commodities: Facilities development and commodities purchases have been handled successfully. Office, laboratory, and experimental facilities have been built to support a continuing program of vertebrate pest management. Some additional construction is anticipated to further enhance these activities.

Constraints to Progress

The Pest Management Program has been operational for some time and has found, within the scope of vertebrate pests, several clear directions for its activities. It appears that there are no serious constraints to its operations as it has had considerable time to work out effective procedures.

The non-vertebrate pest portion of the Project has not yet begun. It is expected that some start-up delays will be encountered, but that the role for these new specialists will be sufficiently well-defined that they should make swift progress once they are on duty.

Recommendations

The Pest Management activities need to be fully integrated into the Farming Systems Research. Many opportunities exist for useful input, and the Team recommends that the Project move toward this additional level of integration with some haste.

BARC should examine the relationship of this program with the activities of the private sector. The privatization of pesticide distribution offers an opportunity and a challenge. The opportunity is that now, in addition to the government extension network, there is a private network of dealers to spread any new methods of control that involve chemicals. The private sector reacted quickly to the opportunity to sell zinc phosphide for the rat campaign, and will undoubtedly react equally quickly to other opportunities. In addition, they can be a valuable source of information. The challenge is that the BARC group must remain a neutral source of information for farmers about these chemicals. This may not be easy at times, given the amount of influence some companies can bring to bear.

3. Special Responsibilities of BARC

3.1 MANPOWER PLANNING AND TRAINING

The purpose of training in this Project is to improve the capacity of the agricultural research institutes to do research that is useful to farmers. In addition, the Project Paper proposed in-country training of extension officers and anticipated that 10,000 farmers would participate in farmer field days and special training programs in connection with the Farming Systems Research program.

The Contract and amendments have provided for several types of training. These include: (a) Ph.D. and Masters degree training in the U.S. and third countries, (b) Masters degree training in Bangladesh, (c) short courses outside and inside the country, and (d) sabbatical leave for faculty members of BAU and research staff of the research institutes.

Progress

The Training Cell of BARC has made some notable progress. It has only been in existence under Mr. Hosain since the beginning of 1982. At about the same time, the IADS Specialist Dr. Davy arrived. In the following year and a half they have been able to set up a formal structure for selecting candidates for overseas training; conduct a survey of current manpower availability and needs; select the candidates for degree training; send 11 people out for short-term training; select 6 scholars for sabbatical leave, and conduct 15 in-country courses for farmers, extension agents, scientists, and journalists. In spite of this achievement, however, less than 10% of money budgeted for the period June 1981 to June 1983 has been spent.

The slow growth of expenditure is a matter of concern to the Donor. However, given the context of this Project, and the nature of training programs, it was not taken as a matter of great concern by the Team for the following two reasons. First, when Phase II started, it was clear that a more formal structure was required to select candidates for degree training than had been used in the past. The selection process that BARC used to distribute World Bank financed scholarships selected a number of weak candidates who returned without a degree. Thus, to prevent a repetition of that undesired outcome, the Council recognized that

a better selection process was necessary. The results are to be found in the "Yellow Book." The process, which is now undergoing some minor revisions, appears to be a fair one. Most people who have been involved in the process seem pleased with the way in which the system is working. Thus, the time that was used to initiate and implement this system seems to have been well spent. The second reason for not being alarmed by the low percentage of funds spent is that the fellowship program will now be absorbing funds much more rapidly. The Ph.D. candidates and about a third of the Masters candidates have been chosen. Expenditure on a number of them will start in May 1983, when eight candidates depart for the Philippines. Expenditures will rise considerably in August when seven students leave for degree training in the United States. Of somewhat greater concern is short-term training. In this area, BARC is behind schedule and likely to stay that way. Short-term training is discussed further in the section on constraints.

Another important achievement of the Training Cell was the initiation of manpower planning for the research system as a whole with a scientific manpower survey. Inventories of research workers have been carried out in the past, but the most recent one was in 1977. This survey not only asked for information on how many scientists were in place, but also asked for the numbers who were about to retire, and the number who were out for training. In addition, it attempted to find out how many scientists were needed. It did this in two ways: first, it asked the Institutes how many people were needed in different fields; secondly, it asked for the number of vacant positions. The first measure turned out to be a wish list without much meaning. The second tells what jobs are available, but not the actual long-term demand for scientists, which is determined by the needs of the farmers of Bangladesh. The most recent inventory also does not get at the question of the quality of the research staff, which is also an important factor in determining future training needs. However, this is still an extremely important beginning of manpower planning.

Problems and Constraints

Short-term training, both inside and outside of Bangladesh, has fallen considerably behind schedule. One major reason for this problem is the shortage of staff in the Training Cell. As mentioned, the two senior staff members arrived at BARC in January 1982. They have one SSO and a secretary. This is inadequate for the amount of short- and long-term training that they are supposed to handle. The overseas short-course training has had the special problem that the government has been reluctant to let people go out for short courses. However, Mr. Hosain and Dr. Davy feel that this constraint is easing somewhat

at present. Regarding in-country training, the major constraint has been the shortage of good trainers in the country. Thus, the Cell has had a difficult time in locating trainers and has not been satisfied with some of the training that has been organized.

The Team was asked to assess the use of training resources with reference to Bangladesh's food production needs. At present, there is no plan that attempts to connect the country's food production needs to the needs for training. The report by Hosain and Davy, "Research Manpower in the Agricultural Science," indicates that "there is an apparent oversupply of scientists in the fields of plant breeding and soil science. The most obvious need is in agricultural engineering. Agronomy and horticulture also present gaps in available scientific manpower" (p.13). Another critical need that they identify is training in Water Management and Irrigation. If consideration of the quality of the scientists and the actual needs of the country are taken into account, it is clear that Livestock and Fisheries would also need help. Their assessment only indicates where there will be vacant positions. However, it is the only guide presently available.

The actual allocation of scholarships does not seem to take these needs into account. Despite the comments about the oversupply of scientists in plant breeding and soil science, two of the five Ph.D. students are in these fields. The Masters students seem to be better allocated, with only one in plant breeding and the other 12 in less crowded areas. It is not clear from the "Yellow Book" how these scholarships are directed into priority areas. An appropriate scheme should be described.

The training program is so far not really a national program and appears to have contributed little to "multi-institutional program integration." The bulk of the first group of scholarship candidates was primarily from BARI and BAU, with a limited number from BRRRI and BJRI, and none from BSRI. This is probably because these institutes did not nominate candidates. However, the fact remains that these scholarships, which were to go to the system as a whole, are presently seen to primarily benefit the two institutions. The overseas short-term training has also primarily gone to BARI scientists from BRRRI and BWDR. The overseas travel money has been primarily used by the Member Directors of BARC--a disposition of funds that may be defensible and, indeed, unavoidable, but that may have resulted in some enmity in some quarters of the participating institutions. The short courses financed by this program include several courses at BRRRI. The rest were at BARI, BAU, and BARC.

Recommendations

The Team recommends that the staff of the Training Cell be increased by at least five professional and associated support staff and commensurate office space so that the Cell can handle

the present scholarship program more effectively and analyze and update the inventory of scientists. Further staff would be required to adequately handle presently neglected areas, such as Livestock and Fisheries.

The Team suggests that the budget for in-country short courses be reviewed. Due to the lack of Training Cell staff and suitable trainers, the projected number of short courses (72 in one year) cannot be fully implemented. More consideration might be given to using outside consultants to offer short, in-country courses analogous to the Colorado State University course on Water Management.

The Team suggests that a manpower development plan be set up in conjunction with the revision of the National Agricultural Research Plan of 1979. Manpower planning cannot be done without reference to a plan that defines the country's demand for scientists. This planning must also give consideration to the needs of the research institutions for managerial and technical staff.

The Team recommends that additional planning be done to ensure that scientists returning from training are placed in situations where they can be productive. Consideration must be given, not only to the job that they are expected to do, but also to the facilities that they need, and ways in which they can be kept in contact with their teachers and colleagues. One effective means of easing the transition is to bring the students back to Bangladesh to conduct the research for their degree. This will force students to do their theses with the facilities that are available in Bangladesh and teach them how to do research there. Thus, when they return, they are ready to work. This has the additional benefit of producing research on Bangladesh problems.

The Team suggests that short courses on writing research proposals and research reports be instituted. Courses on research management could also be useful.

One of the expressed purposes of this Project was to train scientists to work with farmers. Thus, BARC should consider funding and expanding the BAU internship program, which was initiated last year. This program, with the support of E and RP and BAU, provided three-week internships for 125 outgoing students in five BARI substations in the Northwest. Faculty members also visited these substations to evaluate the program. Thus, both students and faculty members got some exposure to work on substations and the T and V system in the Northwest. The weakness in the current program is that it does not put students directly in touch with farmers. An expanded program should include several weeks for doing a survey of villages around the station. These surveys should deal with questions regarding the

relationship between the farmer and the substation, such as: Does the farmer visit the substation? Does he have any influence on the program of the substation? Has he ever learned anything from the scientists?

3.2 COMMUNICATION AND INFORMATION SYSTEMS

The purpose of the information and library services program is to strengthen the information and communication services of BARC and the participating institutions. This includes an expansion of the agricultural library and documentation services.

Progress

Dr. Hutchcroft recently arrived as the Specialist. He has defined his specific objectives as:

- (a) Improvement of decision makers, understanding of agricultural research, and increasing their support for research activities.
- (b) Improvement of information exchange among agricultural scientists and extension workers.
- (c) Assistance in the development of the agricultural library and documentation services.
- (d) Encouragement of closer working relationships among agricultural scientists, administrators, and institutions.

This is a newly initiated program so that only a little concrete progress was made on these objectives. A number of activities are in the early formative stages.

A newsletter describing the activities sponsored by BARC has been designed. Its intended circulation is about 2,000 scientists. The first issue is complete and awaiting final approval. This sets the format and style for subsequent issues, which are planned quarterly, although they may appear more frequently later. It is anticipated that future issues will be written by a BARC staff member.

Specific documents, such as a revised version of "This is BARC" and a short fact sheet are also planned, but not yet done.

The National Agricultural Library currently exists within BARC and is staffed with a trained librarian. The holdings of the BARC collection will be expanded by the addition of approximately 100 journal titles; these will complement existing subscriptions in the country. Hopefully, many of these journals will be held at Joydebpur where the largest concentration of scientists live and

work. Photocopy machines will be purchased to assist in the distribution of needed materials. This provision follows many recommendations for improving this capability.

The current shortage of operating funds is due in part to the policy makers' lack of understanding of the value of research. Thus, public relations activities that make policy makers and their clientele aware of the contributions of research are very important. Several activities are underway. The production of a publication that emphasizes the economic value of agricultural research is planned. The short training course for journalists was a valuable public relations move. Early discussions are being organized to assist in the celebration of BARC's tenth anniversary.

This is a program that is difficult to implement effectively. Considerable dedicated effort often goes unnoticed since the activities frequently seem to be outside the mainstream of the hard-core scientific effort. Properly handled, however, the support provided by these activities can lift the disciplinary research to a new level of professionalism and provide it with a more substantial base of political and financial support.

Technical assistance: Dr. Hutchcroft is experienced primarily in the "publications" portion of these activities. The existing library staff and numerous consultant reports help provide technical assistance support for the "library documentation" activities.

Consultants: The BARC publications program has been reviewed (Breth, 1982) and found to be understaffed, relative to its needs. The production process was also criticized, while recognizing the constraints of government printing regulations. His recommendations include the establishment of a small BARC production unit that has in-house capabilities to write, edit, and print high-quality documents.

Training: A seminar of librarians was held last year and another one is planned this year. A course to inform journalists of current research activities was held early this year.

Contract research: A sizeable commodities budget exists to improve the documentation collection. This will be an important addition to Bangladesh's agriculture research infrastructure if it is properly maintained and made available to the researchers. Unfortunately, the BARC library is not close to any large research site. This may decrease its value unless adequate linkages are developed with other institutions. Certainly, the photocopiers planned for purchase should help.

Constraints to Progress

The activities being taken on by this program are too new to detect any significant constraints, although a few general observations are in order.

These activities are highly dependent on skilled manpower. Writers must be creative, motivated, and skilled in the use of English and Bengali. Editorial work will require an experienced person who is sensitive both to the disciplinary content and publishing requirements. Library acquisition involves disciplinary knowledge and an ability to handle a heavy volume of paperwork. People with these abilities will get some of the planned activities started, but many other skills are needed to achieve full implementation.

Throughout the programs of ARP II, a common limitation has been the inability to employ people with adequate training to do the necessary tasks. It is anticipated that this will happen in this specific program as well. There are too few staff positions and, while people with training in library skills are available, good ones are scarce, especially those who also know something about agriculture. Another problem may be the lack of cooperation between different institutions. The Bangladesh research institutions have not been able to cooperate in library development in the past.

Recommendations

Dr. Breth's (1982) consultant report on BARC's publication program contains many useful suggestions regarding production problems and suggestions that should be useful in implementing an expanded publications program. In addition to streamlining the production program and improving its quality, the Project might want to consider supporting increased press runs so that more copies of useful publications can be distributed; this is a particular problem for Bangladesh's scientific journals. A side benefit of this may be that more journals will be available on an exchange basis. In expanding this program, careful attention must be given to minimizing demands for new manpower.

Library acquisition should involve the production of a Union List of Agricultural Serials. In parallel, it should be possible to get Specialists' suggestions of journal titles that they feel represent a core collection. Together, this information can form the basis of an order. The use of a multi-year contract-purchasing arrangement for journals and technical monographs should be considered. This would greatly simplify the ordering process and help ensure that it is possible to get new monographs before they are out of print, an increasingly difficult problem for specialized publications.

Some attention should be given to reestablishing the linkage into the AGRIS system. This will help make Bangladesh's research contributions better known, and will improve the probability of the exchange of relevant materials from other tropical and subtropical areas.

The Team recommends that the major collection of books and periodicals be located near the major concentration of working scientists, which means they should be placed in the BRRI and BARI libraries. BARC should be a coordinating agency for circulating lists and tables of contents of new acquisitions. Efforts must be made to develop a system to transfer photocopied material quickly throughout the research system.

The public relations role of BARC is an extremely important one. The agricultural research system desperately needs local political support for sufficient operating expenses. Foreign aid for research will not last forever. Thus, emphasis needs to be placed on strengthening the public relations activities at BARC.

3.3 LINKAGES BETWEEN RESEARCH, EXTENSION, AND FARMERS

The primary purpose of this part of the Project is to improve the flow of information between farmers and scientists. In an effective research system, information is flowing both from scientists to farmers and from farmers back to scientists. In the recent past, and probably still, there has been very little information flowing from farmers to scientists, which is part of the reason why some of the scientific research has not been very relevant. One of the primary reasons for placing this Project in the context of Farming Systems Research was to ensure communication between scientists and farmers so that the research will be especially relevant to small farmers.

The strategy for increasing information flows has several components. First, it will help scientists come into direct contact with farmers through the FSR program. Second, it will strengthen linkages with farmers and extension through development of regional stations. Third, it will strengthen the BARI Field Trials Division to assess and spread new technology. Fourth, scientists at all levels will increase their contacts with extension through a series of activities. The program includes (a) strengthening the linkages and conducting workshops where research and extension personnel discuss farmers' problems and translate them into research programs, extension information, and training materials; (b) regular extension personnel visits to the stations; (c) designation of research staff for training and advising extension staff and helping them design on-farm trials and other farmer training programs; (d) adoption of a village by research and extension staff in which the scientists would apply

their own recommendations; and (e) introduction of a farm-level monitoring and feedback mechanism into the research program. This monitoring will be carried out by the Agricultural Economics Divisions of the BARC complex and will use periodic farm-level surveys to measure the pace of adoption of new technology and the impact of the technology on productivity, employment, and income.

Progress

The activities of the Project in farming systems are discussed in Section 2.3. Substantial progress had been made, but it is not clear that this program has actually forced many scientists to communicate more closely with farmers or that the information generated has had much impact on the research programs of the institutes.

The development of the regional stations is an important part of the Project. This Project has contributed to the stations' development by providing technical assistance at three of the regional substations. They have taken part in upgrading the layout of the experiments and analysis of results. The Project has also provided assistance in finishing the development of the experimental fields. The scientists have been given some training in descriptive statistics.

The regional stations have, under the Project, started to improve their links with extension and farmers, although it was clear that the scientists on these stations had closer contact with farmers than their counterparts at Joydebpur. The Cropping Systems and Soil Fertility Contract Research Projects encouraged some of the junior scientists into contact with farmers. At almost all of the stations visited by the Team, there are now regular field days for farmers and extension agents, and many of the stations have short training courses for farmers and extension agents. In the Northwest BARI regional stations and substations, the extension and research people discuss the regional research programs at the planning stage.

Perhaps the most successful linkage between research and extension developed during the Project was the rat control campaign in wheat. An excellent joint extension program was conducted in late 1982 and early 1983 between the Vertebrate Pest Section of BARI, The German Plant Protection Program, and the Extension Service. The early planning meetings were held at BARC. A multimedia campaign for controlling rats in wheat was launched in January 1983. Plant protection assistants (250 in 11 wheat-growing districts) and other government officials and extension personnel were given simple instructions in rodent control methods, plus campaign materials to distribute and ready-made zinc phosphide baits to sell to farmers.

The multimedia campaign used motivational instructional posters, school comic leaflets, and farmers' leaflets plus radio messages, TV coverage, newspaper articles and farmer meetings to create awareness and motivation for rodent control in wheat. Over 200,000 bait packets were sold to farmers at Tk.2.00 each by the two projects and three private formulators. The media posters and the extension personnel did their job well; and by radio, especially by the morning farm news, an excellent job was done of reaching the farmers. The end-of-campaign survey showed good results. Some farmers used the project ready-made bait packets, some used other poisons, and some used no controls. They suffered 1.92, 2.92, and 3.09% damage, respectively.

The program encompassed many components of a good extension program: (a) an inexpensive technology from (USAID financed) research; (b) linkage between extension, research, and the farmers; (c) training for extension in technology; (d) training materials and information flow between extension and the farmers, assisted by the media; (e) application of the technology; and (f) continuing supply of bait for the farmers after the campaign. Private formulators are now producing the bait using locally produced flour as the base.

Problems and Constraints

Government restrictions on travel have severely limited the ability of scientists to move out into the countryside. This is particularly serious for the scientists at Joydebpur, who should be traveling throughout the country.

The shortage of operating funds has its most serious effects in the regional stations and substations and on the travel budgets. Thus, these two key elements for improving the contacts between scientists and farmers are seriously constrained.

The general weakness of the regional stations is still a constraint to improving linkages. The regional research programs at these stations are still in their infancy. At Jessore it was estimated at about 10% of their total research. There are relatively few well-trained scientists at the regional stations and too many at Joydebpur.

The current reorganization of the extension service should, in the long run, rationalize the extension system and make it more effective. However, in the short run it has caused considerable confusion with people being shifted from one part of the country to another. This has disrupted some of the ties that had been built up between research and extension, and undoubtedly will disrupt more ties before things settle down.

Recommendations

The Project Paper suggests that research projects be developed to monitor the diffusion of new technologies and their impact on productivity, income, and employment. The Team suggests that such studies be taken up and that they be done in cooperation with extension, if possible.

Regional research programs at each station, with substantial impact from extension and farmers, must be developed. The idea of centers of specialization at the different regional stations as proposed in the Project Proposal should be pursued more vigorously. At Ishurdi, research scientists seem to use extension's inputs effectively in research planning, and they are now attempting to educate farmers about how research is done so that, in the future, these farmers can also help set the research program. The Ishurdi system is perhaps not perfect, but the general approach should be followed at other regional stations. Such moves are underway at Hathazari Regional Station.

The field trials division at BARI still does not seem to be very effectively coordinated with the other divisions. The Project Paper proposes that the Project help strengthen it, and with this the Team agrees. It could, but does not, serve as a major way of testing and popularizing technology.

The CSR program should be the center of more interaction between scientists, extension, and farmers. At present, the patterns that are being tested were mainly determined in Joydebpur or Dhaka without consultation with the farmers, extension workers, or even the scientific officers at the sites. Farmers did have some input in Ishurdi. Scientists have not attempted systematically to find out whether farmers are adapting any of the new techniques that the CSR is introducing. This should be an integral part of the CSR program.

Finally, IADS must assist BARC to make the case for more freedom of scientists to travel within Bangladesh.

4. Special Responsibilities of IADS: The Specialists

A large increase in the Technical Assistance staff has taken place in a short time. Since most of these specialists are assigned to BARC, its absorption rate seems to have been near saturation. As a result, it does not appear that BARC is realizing maximum contributions from the IADS Specialists. There has been insufficient opportunity for more than a few of the Specialists to become viewed as counterparts to the Member Directors or other senior staff. Rather, some specialists seem to be viewed as employees to carry out lesser day-to-day assigned activities. As experienced professionals, most will eventually provide more valuable service than presently seems to be the case. The local "system" seems to take some time to learn how best to use such staff resources.

With the rapid increase in Technical Assistance activities, one of the things that has slipped is the development of Project planning documents. The Team recognizes that much paperwork has been done and that some forms of plans exist. What is lacking is the system that pulls this information together, presents it in an easily used format, and makes it readily available to everyone who needs it. Therefore, the Team recommends that more attention be given to the preparation of annual workplans.

At the risk of being pedantic, the Team offers the following observations. Good plans are essential as guidelines for further operations and for evaluation of progress. Each Specialist needs to prepare, in collaboration with the appropriate BARC officials, a general workplan for the life of the Project, laying out the program objectives, how and with whom the work will be accomplished, the support required, and the means for accomplishing the objectives. This workplan should be accompanied by a financial plan (not just a budget), detailing the sources of the funds, for what they will be used, and the time frame in which they will be needed. From these master plans, detailed annual work and financial plans can then be prepared for each year's activities. These annual plans should be updated and modified periodically, if the need arises. Periodic progress reports and evaluations should be based on performance in implementing the workplan. By laying out a clear-cut program, with responsibilities assigned and actions to be taken by everyone, a much smoother operation should occur.

There is a need for regular meetings to discuss progress, problems, and possible program modifications. These provide an opportunity to iron out problems and conflicts before they become serious and adversely affect progress. The Team was pleased to learn that such meetings are now held each quarter.

The Team was given diverse opinions as to the value of the Specialists in general. Individually, most were seen (by their counterparts and others) as making a valuable contribution to furthering achievements in agricultural research in Bangladesh. These contributions were sometimes of a coordinating or teaching role, most often as a facilitator of research, and frequently as a crucial financial helper through the judicious application of their discretionary funds.

Against these supportive remarks the suggestion was offered by some BARC staff that there were too many Specialists doing too little that was useful. The Team formed the judgement that this was probably the result of the rate at which Specialists have arrived, the usual problems of settling into new assignments, and, possibly, the presence of some Specialists at BARC who were assigned to BARI. This last point is worth emphasizing. BARC has very limited office space and crowding is an undignified way to treat a professional. Therefore, every attempt should be made to disperse Specialists to the places where they may best do their work. Many of the new Specialist appointments call for assignment to BARI. This should keep these people from further straining an already difficult situation.

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Annex A. Terms of Reference

1. Assess the use of the following Project resources in terms of their cost-effectiveness and relevance to Bangladesh's food production needs:

- A. long- and short-term technical assistance,
- B. training,
- C. contract research,
- D. sabbaticals,
- E. commodities, and
- F. construction.

2. Evaluate both BARC's and IADS's performance in terms of planning effective use of these resources and in implementing, monitoring, and evaluating activities associated with these resources.

3. Assess the extent to which these resources have been used to strengthen a multi-institutional research capacity, under BARC's leadership to design, test, and evaluate farming systems that increase Bangladesh's land, labor, and water-use efficiency.

4. Evaluate the development of practical research manpower skills attributable to this Project.

5. Assess the degree to which this Project has contributed to linkages among scientists, extension workers, and farmers in terms of quality, quantity, and responsiveness.

6. Evaluate the disbursement of USAID and GOB contributions in terms of adequacy, timeliness, and relevance.

7. Assess the performance of USAID in terms of financial, technical, and managerial support and guidance.

8. Evaluate the impact of USAID-funded research activities on farmer adoption of improved crops, practices, inputs, and other elements of farming systems. Describe farmer relationships to and performance under the Project.

9. Assess the impact of the Project on coordination between BARC and participating institutes in mobilizing scarce research resources and directing them toward common food production targets with optimal use of resources and minimum duplication.

10. Analyze the contribution of each of the following Project resources to multi-institutional program integration: technical assistance, training, contract research, and sabbaticals.

11. Determine the relevance, cost-effectiveness, and use of the results achieved in each of the seven technical program areas: farming systems, economic/social sciences, crops, livestock, soil, water and pest management.

12. Examine the BARC Training Cell and determine if the present support levels are adequate to manage the \$3,000,000 project training component. Describe recommended support levels and procedures.

13. Assess Project administrative and support services for IADS Specialists and Consultants.

Annex B. Budget and Progress on Expenditures

At the time of the evaluation, the most recent data available on expenditures were as of March 31, 1983. The Team has summarized, in Table 1, the categories of information provided to it by IPSU in the Financial Statement, revised May 10, 1983.

Categories of Expenditures

Consultants: There has been very little use of consultants in any of the programs, although their services are generally seen as important. Based on an average expense of \$8,000 per month, less than one man-year has been spent and nearly five man-years of consultant services remain. Presently, there is no concrete plan for hiring more consultants. There has been a recent problem with the GOB not approving some proposed consultancies, particularly when these are proposed to be contemporary with other missions to BARC, including Evaluation Teams.

Overseas training: Apart from the slow start-up problems noted in Section 3.1, there have been many difficulties with CMLA approval for Bangladeshi scientists to travel outside the country for training, especially in groups.

Contract research: The problem area for the slow expenditure of contract research funds is in the Water Management Program. This program has 66% of the funds for this expenditure category. The "Yellow Book" procedures should be followed in a more deliberate manner.

Commodities: Problems with customs and duty taxes have hampered the acquisition of commodities. The expenditure figures show only 21% of the intended purchase being made. What is not apparent is that few of these purchases have been shipped; they are being stored on the East Coast until the situation with taxes is resolved. All ordering has also been stopped until this problem is resolved, creating further delays and the possibility of a log-jam when ordering resumes. Some attention to a priority system should be considered to ensure that critical delays do not occur. There are signs that these problems are being resolved during May 1983.

Table 1. July 1981-July 1983 budget and July 1981-July 1983 expenditures, in rounded thousands of dollars.

	<u>Specialist</u>		<u>Consultants</u>		<u>Local Support</u>		<u>Overseas Training</u>		<u>In-Country Training</u>		<u>Contract Research</u>		<u>Commodities</u>		<u>Total</u>		<u>Remaining</u>
	<u>Budget</u>	<u>Spent</u>	<u>Budget</u>	<u>Spent</u>	<u>Budget</u>	<u>Spent</u>	<u>Budget</u>	<u>Spent</u>	<u>Budget</u>	<u>Spent</u>	<u>Budget</u>	<u>Spent</u>	<u>Budget</u>	<u>Spent</u>	<u>Budget</u>	<u>Spent</u>	
Res Sys Mgmt	352	307	100 (A)	13	388	198	37	5	29	5	0	0	550 (B)	207	1464	735	50
Tech Support	506	156	34	7	0	0	23	1	17	3	0	0	288	40	868	207	76
Farm Sys	616	324	34	0	0	0	77	25	37	4	0	0	176	49	940	402	57
Ag Econ & S/S	264	101	68	4	0	0	42	0	23	5	23	18	124	14	544	142	74
Crops	286	130	72	5	0	0	28	2	48	6	90	83	212	8	736	234	68
Livestock	66	0	34	0	0	0	14	0	31	3	7	4	32	1	184	8	96
Soil Mgmt	132	58	0	8	0	0	24	2	21	3	23	39	60	0	260	110	58
Water Mgmt	178	76	151	26	32	0	62	7	192	12	208	36	226	12	1047	169	84
Pest Mgmt	66	0	34	0	0	0	25	1	22	1	0	0	52	11	199	13	93
Total	2464	1152	535	63	420	198	332	43	420	42	351	180	1720	342	6242	2020	68
Remaining	53		88		53		87		90		49		80		68		

(A) Includes \$40,000 for external evaluation.

(B) Includes \$100,000 for construction works.

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Specialists: As noted in Table 2, there have been delays in filling some Specialist positions and in retaining people in others. The net result has been that expenditure has slipped somewhat behind budget. With the present implementation schedule, expenditures will plateau over years 3,4, and 5 rather than peak in years 2 and 3 as had been planned (Contract, Amendment 6).

Program Area Expenditures

Technical support: Now that this program is fully staffed, expenditure should increase. Recommendations have been given elsewhere (Section 3.3), which may assist in the use of commodity funds in the Information and Library Program.

Agricultural economics and social science: This program is generally behind in expenditure because of the slow appointment of the second Agricultural Economist and the problems noted above for approvals for Consultants and Overseas Training.

Livestock: The start-up of this recently expanded part of ARP II and some staffing difficulties point to this program as an area in which critical attention should be placed. Recommendations elsewhere (Section 2.9) indicate, however, that the funds can be employed effectively if the work program being formulated is soon finalized.

Pest management: The level of activity in this program is not reflected in this budget statement; the vertebrate pest management activities are funded directly through a PASA agreement. The delay in spending is a result of the delayed start of the entomology and plant pathology activities.

Table 2. IADS Specialists

Program Area	Title	Contract Years	Incumbant	Starting Date
1 RSM	Project Supervisor	4.5	Dr. D. Daugherty	January 25, 1983
	Administration	5	Mr. R. Semmes	January 15, 1983
2 TSS	Farm Development	3	Mr. D. Sharma	July 1, 1981
	Training	2	Dr. D. Davy	January 15, 1983
	Information	3	Dr. E. Hutchcroft	March 15, 1983
3 FSR	Maintenance (a)		No Action	
	Farming Systems	5	Dr. H. Manzano	September 1, 1981
	Assoc. Agronomist	3	Mr. T. Kelly	March 14, 1982
	Assoc. Agronomist	2	Mr. Mallick	May 30, 1982
	Assoc. Agronomist	2	Mr. R. Drew (Resigned after 1 year)	June 1, 1982
	Assoc. Agronomist	2	Mr. P. Villegas	May 1, 1982
4 ESS	Agricultural Econ I	5	Dr. B. Greene	January 15, 1982
	Agricultural Econ II	3	Approved but no one suitable yet found	
5 Crops	Crops	4	Dr. A. Kaul	August 2, 1982
	Agronomist	4	Dr. R. Frazier	November 11, 1982
	Horticulturalist	2.5	Position approved by BARC; candidates now being sought	
6 Livestock	Livestock	2	No Action	
7 Soils	Soil Fertility (b)	4	Dr. S. Portch	November 21, 1982
8 Water	Water Management	5	Dr. J. Gerards (Left April 10, 1983; replacement not yet found)	September 5, 1982
	Extension	4	Dr. D. Gisselquist	December 24, 1982
	Ag. Engineering	4	Dr. Carlos Garces	
9 Pest	Plant Pathologist	2	Appointed as of: (Approved; recruitment commencing)	September 24, 1983
	Entomologist	1	No Action	

(a) This function has, to date, been covered by short-term consultancies of an Instrument Repair Specialist.

(b) This four-year appointment subsumes the originally scheduled Soil and Plant Analyst (Contract, Appendix A), as well as the Soil Fertility Specialist. Both were indicated for two years.

Annex C. Institutions Contacted by the Evaluation Team

BARC

Dr. Kazi Badruddoza, Executive Vice-Chairman
Dr. M.A. Mannan, Member Director
Dr. Ekramul Ahsan, Member Director
Dr. M.M. Rahman, Member Director
Mr. A. Mannan Chowdhury, Director, IPSU
Mr. A. Hossain, Director, Training Cell
Dr. G.M. Shahjahan, PSO Livestock

Others involved in the Contract Research Evaluation were:

Dr. H.R. Khan, Water Consultant
Dr. P.A. Batugal, SERCGSRA

ADC

Dr. Gerard Gill, Associate

IADS

Dr. David M. Daugherty, Team Leader, IADS
Dr. A.K. Kaul
Dr. Dorsey Davy
Mr. L.C. Sikka
Mr. Raphael Semmes
Dr. Russel D. Frazier
Mr. Tim Kelly
Dr. Theodore Hutchcroft
Dr. A.H. Manzano
Dr. Ben Wallace
Dr. Brook A. Greene
Dr. David Gisselquist
Mr. D.N. Sharma
Dr. Sam Portch
Mr. L.M. Villegas

USAID

Mr. C. Antholt, Agriculture Development Officer
Mrs. Joanne Hale, Project Officer
Dr. Hugh Plunkett, Program Evaluation Officer

BARI/Joydebpur

Dr. M.H. Mondal, Associate Director
Dr. M.A. Wahab, PSO, Pulses
Dr. M. Zaman, Head, Agronomy Division
Dr. L.M. Elias, Head, Agricultural Economics
Mr. Joe Brooks, Vertebrate Pest Control, USDA
Dr. Amerul Islam, Vertebrate Pest Control, USDA
Mr. Jahiruddin, Agronomy, P.I. Cropping Systems

BARI/Hathazari

Dr. M.A. Quasem, PSO in Charge
Md. Rezaul Karim, SO, Agri Econ
Md. Naziruddin Bhuiyan, DD, Agri Extension, Chittagong District

BARI/Jessore

Mr. Ali Hossain, SSO in Charge
Dr. Ismail Mia, SSO Plant Pathology

BARI/Ishurdi

Mr. Islam, PSO in Charge
Dr. Jainal Abedin, PSO, Soils

BARI/Bogra

Mr. M.M. Bhuiyan, SSO in Charge

BARI/Jamalpur

Mr. Ali Ahmed, PSO in Charge

BARI/Comilla

Mr. Y. Nuri

BIRI

Dr. Zaman, Director
Dr. Frank Sheppard, IIRI Representative
Mr. Nizam U. Ahmed, PSO, Cropping Systems

BJRI

Dr. Kasem Ali, Executive Director
Dr. M. Myser Ali
Dr. Khan Majlish, Program Leader, Cropping Systems
Dr. A.H.M. Mosharraf Hussain, Chief Scientific Officer (Chief Breeder)
Mr. A.K. Azad, SSO

BAU

Dr. Altaf Hossain, Program Leader, Cropping Systems
Dr. Yaqub, Principal Investigator, Soils
Professor M.R. Biswas

Rural Development Academy, Bogra

Mr. Keith Gorey, FAO Team Leader
Dr. Amzad Hossain, Project Coordinator

Christian Reformed World Relief Committee, Bogra

Mr. Paul Brink, Research Unit Head

World Bank

Dr. Gotz Schriber, Country Economist, Washington
Dr. Depak Dasgupta, Country Economist, Washington
Dr. Anand Seth, Resident Mission
Dr. Said Mawly, Resident Mission

FAO

Mr. Hugh Brammer, Agriculture
Dr. Neil Byron, Forestry

German Plant Protection Program

Md. D.U. Khan, Department Director, Plant Protection
Mr. Heim Posamentier
Mr. Aad Van Elsen