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# REPORT OF BRRI REVIEW MISSION

November 12-23, 1984

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**Bangladesh Rice Research Institute**

Joydebpur, Dhaka.

Bangladesh

PD #112 199

EXTERNAL REVIEW MISSION REPORT

November 12-23, 1984

RICE RESEARCH AND TRAINING PROJECT  
Phase II, 1981-85

Implemented by  
Bangladesh Rice Research Institute  
Joydebpur, Bangladesh

Assisted by  
International Rice Research Institute  
Manila, Philippines

Donors:

The Ford Foundation  
Australian Government  
Canadian Government  
United States Government

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November 23, 1984

## FOREWORD

This Review is the fifth biennial appraisal of the work of the Bangladesh Rice Research Institute (BRRI) made on behalf of the donors and the Government of Bangladesh. Review Team members were named by each of the donors plus one member designated by the International Rice Research Institute (IRRI) and one member designated by the Bangladesh Agricultural Research Council (BARC). In addition, IRRI (which administers the technical assistance, training and procurement components of the project on behalf of the donors and BRRI) made available the services of Mr. Bart Duff as a resource person for the latter part of the Team's work.

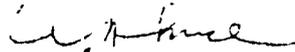
In partial accordance with a recommendation appearing in the fourth biennial Review, the Team Chairman arrived in Dhaka 10 days before the formal Review was to commence in order to visit two Regional Stations and to become more familiar with rice culture in Bangladesh by examining some on-farm research experiments. The rest of the team assembled in Dhaka to begin the Review on November 12th.

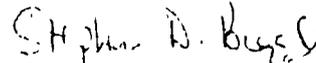
During the Review period, which culminated in the completion of this Report on November 23rd, the Team had extensive discussions with BRRI administrative and scientific staff, with Extension personnel both in Dhaka and at some of the Regional Stations, with various government officials in the Ministry of Agriculture, and with representatives of other Institutes and organizations which included the Bangladesh Agricultural Research Institute (BARI), BARC, The Bangladesh Water Development Board, and FAO/UNDP. The Team also travelled by chartered aircraft to assess facilities and work at three of BRRI's five regional stations (Rajshahi, Barisal, and Comilla) and flew over the other two Regional stations which previously had been visited by the Chairman (Habiganj and Sonagazi).

The Team's work was enhanced considerably by the lively, frank and open discussions as well as the willingness to speedily provide information and/or visitations as requested. We wish particularly to record our appreciation to Dr. S.M.H. Zaman, Director-General BRRI and his staff for their helpfulness and hospitality, and to Dr. Frank J. Sheppard Jr., IRRI Representative for the efficient arrangements he continuously made on our behalf.

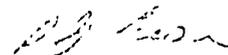
The Review Team is agreed on the opinion and recommendations contained in the report that is herewith submitted to the donors, the Government of Bangladesh and to the Director-General and staff of ERRI. We trust that our recommendations will be of some assistance in strengthening ERRI in its difficult task of further developing and transferring improved and economically and socially useful technology to the diverse farming communities of Bangladesh.

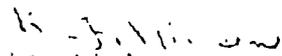
Respectfully submitted

  
Kamal Uodin Ahmad

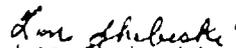
  
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SUMMARY AND RECOMMENDATIONS

1. The review team was impressed with the progress of BRRI during the period of the second five year plan. Its Joydabpur facilities have been steadily developed as has the professional capability and stature of its scientific staff. BRRI is now a viable organization with a history of achievement.
2. Major accomplishments to date have been the development of high yielding varieties which have been widely adopted in the boro season and are increasingly becoming accepted in t.aman; cropping systems that make more intensive use of land without increasing exposure to risk; and the identification of major soil deficiencies and suitable low cost treatment.
3. BRRI has now developed into a large and mature organization; as such, task forces and other research management systems used in the past may be no longer appropriate and should be reviewed.
4. Most serious problems were related to management and development of research priorities. It is recommended that there be a thorough review of the system by management specialists. Financial management should be improved, not simply as an accounting device but as a mechanism for clarifying research priorities, setting targets, with financial and manpower budget requirements, monitoring of performance and reprogramming of targets as appropriate. The review team also recommends that as planning proceeds, means be sought to increase BRRI's internal management and administrative capability. This will mean less reliance on IRRI in the long run.
5. The team felt there was considerable scope for improving the efficiency of research. Present research agenda suffer from a lack of focus, from overlap and from insufficient coordination. There is need to orientate research towards the needs of clearly specified groups of farmer clientele. To address these problems and sharpen the focus of research, it will be necessary to replace the package approach to farm recommendations. It is recommended that a menu approach be used by which BRRI places emphasis on providing a range of improved technologies most likely to bring substantial economic benefits to different agro-economic groups of farmers. This can be facilitated by reducing the present proliferation of task forces which stretches resources over too many diverse objectives. It is recommended that research be organized around four key program areas - varietal improvement, cropping systems, fertility, and pest management.
6. Research in all areas should be increasingly oriented to the diverse needs of the farmer clientele in Bangladesh. This must include setting of specific objectives, setting targets and monitoring accomplishments. Field surveys for understanding farmers circumstances and problem diagnosis must be conducted before and during the research process. Specific client groups of farmers need to be defined. Adoption of technology by these specific groups needs to be carefully monitored. In many cases, for example rice technology and engineering, the possible impact of proposed technology should be studied before conducting research. In all areas, monitoring and follow up studies should be adopted by all work programs.

7. In almost every division there was insufficient commitment to on-farm research. This type of research is essential if farmers problems are to be adequately defined; appropriate improved technology is to flow to farmers; and the feed-back is to be obtained. BARRI should increase its work in farming system research.
8. Staff development and training is on schedule. Some modification to the training program is now warranted to reduce slightly the dependence on overseas training and support local training institutes. This should reduce the disruptive influence that prolonged absence has on research programs.
9. Consideration must be given to changing the type of overseas short term training. Attendance at short courses should not jeopardize entitlement for higher degree training overseas.
10. Restriction on travel in Bangladesh are of extreme significance in the overall research effort. This subject should be again pursued with appropriate authorities as agricultural research is of great importance and efficient research is not possible without the ability to travel widely in research areas.
11. A major constraint to BARRI programs was the inadequate development of regional stations. Highest priority should be given to staffing and to improving facilities at these stations; to providing vehicles and appropriate scientific equipment.  

A means must be found to attract scientific staff to the regional stations - possibly through incentive schemes and improved training. A minimum team of about seven scientists at each station is required to actively follow regional research programs.
12. The varietal improvement group have made important progress with the release of BR12, BR14, BR15 and BR16 for the boro season with varieties soon to be considered for release for deepwater areas.
13. It is recommended that the varietal improvement program be organized along crop season lines and that there be greater emphasis on regional and on-farm research.
14. The adaptive testing and diagnosis of cropping systems research should be strengthened with specific attention to diversity across agro-climatic zones, risks of crop damage, differences in the economic environment and resource endowments of the farmer clientele.  

The statistics and economics divisions should be an integral part of this effort, not just to evaluate recommended practices but to help identify directions for new research and technology.
15. The training division should be strengthened to respond to the increase in untrained extension personnel and the need for such staff to assist with important on-farm research. This also helps create strong links between BARRI and the extension service.

16. Work on soil fertility problems should be reinforced with adequate site information and soil testing cooperation should be fostered with the soil analysis section of BARI.
17. The Plant Pathology and Entomology Divisions are doing valuable research, particularly in screening for varietal resistance. Serious consideration should be given to upgrading their screening facilities.
18. The work on the urea nematode should receive high priority as BARI is a world leader in this research area.
19. The Economics Division in BARI is very weak. This division needs strengthening so that it can play an effective role in farming systems and policy research, and in helping to direct BARI research priorities and monitor the adoption of technology.
20. Other parts of the Bangladesh agricultural research and education system have developed significantly in recent years. BARI needs to strengthen the integration of its program with other institutions such as BARI, BAU and BARC.
21. The annual report is an important document for a research institute. It is recommended that immediate action be taken to produce and publish the last four annual reports.
22. BARI's Board has not met for two years. It is recommended that the Board meets soon and on a regular basis.
23. The review team supports a proposal to extend the life of the current donor/BARI/IRRI project to June 1986. It is felt, however, that more emphasis should be given to building up existing Regional Stations in terms of facilities, vehicles and equipment than proposed.  
 Work should begin immediately on the next annual work plan. This should be used as a vehicle for specifying division, task force, and program priorities and budgeting financial and manpower requirements accordingly.
24. The review team were impressed with contribution BARI has made to increasing food production in Bangladesh. The investment of donor funds in this organization has paid handsome dividends. BARI is now a mature organization which is in a position to make important future contributions to the welfare of Bangladesh. However, there is still considerable scope for further development and therefore the review team recommends that donors consider continuing support during the third five-year plan if requested.
25. It is recommended that quarterly meetings be initiated between the donors and BARI administrative staff. This would provide an informal forum for the discussion of progress, problems, and future plans. Suggestions for the team composition and program for future review teams have been made.

## INTRODUCTION

The Bangladesh Rice Research Institute (BIRRI) was established in 1970 in the Ministry of Agriculture as a fully autonomous body dedicated to the development and spread of appropriate rice technology. Its Board of Governors is responsible for policy formulation and implementation within the framework of policy directions issued by the Government of Bangladesh. The Director-General, S.M.H. Zaman, is the executive head and works on behalf of the Board of Governors.

The establishment of BIRRI as an autonomous institute was helped by the Ford Foundation which provided financial support and encouraged a close linkage between BIRRI and the International Rice Research Institute (IRRI) for training, equipment procurement, technical assistance and scientific support. This relationship has since been reinforced by financial support for BIRRI from additional donors which is administered by IRRI. There is a Memorandum of Understanding between BIRRI and IRRI, which lays out the relationships between the two institutions.

The review team was impressed with the physical and scientific development of BIRRI. Development of the physical facilities, particularly at Joydebpur, has been balanced and provides a sound working environment. More important, however, has been the development of the scientific resource. The scientific staff has been strengthened by the staff development and training program at all levels.

There is an obvious commitment and enthusiasm at BIRRI to conduct applied research which can increase productivity at the farm level, and this spirit is to be commended.

The following sections of this report describe, in more detail, the impressions and recommendations of the review team on the facilities, organization, staffing and functions of BIRRI. There will be recommendations that are designed to improve the functioning of the research effort. These should be viewed in the light of the research programs that have been, and are being accomplished at BIRRI. The institute has been responsible for the release of improved varieties for the boro, aus and aman seasons. The varieties are now responsible for more than 80% of the high yielding boro crop. While BIRRI varieties are grown on only about 20% of the important aman crop, it is expected they will increasingly penetrate a greater proportion of the area in future. The institute is also to release improved varieties for the deepwater aman crop. Important developments have also been transferred to farmers in the cropping systems, irrigation and nutrition areas. Increased use of zinc, sulphur and nitrogen fertilizers are undoubtedly improving rice production in Bangladesh. The role of BIRRI in training, particularly of extension personnel, is another very important contribution of BIRRI which is giving important benefits now and in the future.

MANAGEMENT, RESOURCE ALLOCATION AND RESEARCH PRIORITIES

I. Finance and Research Resource Allocation

Many of BRRI's current problems are related to planning and management. A thorough review of the current situation by research management specialists appears warranted. Specific questions to be raised include:

1. Is the current system of reporting and accounting useful in monitoring achievement of the specific objectives and goals articulated by the Institute and by its component parts? What improvements can be made?
2. Does BRRI's administration need strengthening or reorganizing in order to address the ever-increasing planning and manpower requirements?
3. Is the reporting and accounting system flexible enough to accommodate inevitable changes in goals as new problems arise?
4. How can the constraint of domestic counterpart funds be more effectively addressed? Under current policy, is it possible to have the ministry of Finance approve an Agricultural Development Plan that provides for the duties on imported vehicles without an equivalent reduction of the BRRI budget elsewhere? If not, how can this be arranged? In light of the critical importance of food to the welfare of Bangladesh citizens, perhaps it would be appropriate for the Finance Ministry to facilitate the importation of equipment for agricultural research. Since arranging for payment of duties increases expenditures and government revenue by the same amount, this assessment would not be a burden to the government.
5. What arrangements can be made within the existing restrictions, to achieve the research and training goals articulated in the current 5-year plan? For example, short term training courses could be designed to teach the economics of farming systems for non-economists. This would avoid the current 5-year travel restriction following any foreign travel exceeding 3 months.
6. What steps can be taken to reduce restrictions on the purchase of vehicles, other equipment, hiring, promotion, foreign travel and other expenditures?
7. Reports were received by the review team about which supervisors apparently could do little. There seemed to be general dissatisfaction by the research divisions with the labor component of plot work. What recommendations can be given to the BRRI labour committee to minimize these labour problems?

\*(See September '84 AID report by M. Van der Vaen for proforma requirements.)

Some of these problems may be appropriate for discussion by the BARRI Board of Governors. The team recommends that efforts should be made to reconvene the Board to focus attention on these and other budgetary issues.

Management issues should also be reviewed in conjunction with the more general issue of research priorities. A number of the divisions are vague about their research priorities and why they choose to embark on particular studies. The ultimate criteria for research in Bangladesh should be how much the research is expected to contribute to actual rice yields, rural employment and wages, and farm profits. In some cases, research output has immediate implications for recommended varieties and cultural practices. In others, the research contributes to more effective procedures for developing appropriate technology. In either case, one should be able to articulate research programs in terms of the ultimate benefits to different groups of farmers and other groups of rural households.

The system of planning and monitoring should be geared to helping the division specify their research goals, to identify specific output targets, and to budget the financial and manpower requirements accordingly. The system of reporting should be designed to monitor the achievement of targets and, where appropriate, to reprogram goals and targets.

The following table gives some estimates of BARRI expenditures in 1982/83 and 1983/84. It can be seen that about 40% of annual expenditures came from the BARRI/IRRI Project. In addition there are funds from other donors - IDRC, FAO and ODA. In 1983/84 there was also an additional Taka budget of Tk. 4.22 million from PL-480 funds.

The donors are provided quarterly financial reports, annual planning reports, annual progress reports, and special reports as required. While the annual progress reports and quarterly financial reports appear to have been submitted regularly, the annual planning reports have not been received until this year. We recommend that the next annual planning report focus on the extent to which the objectives outlined in the BARRI/IRRI Five Year Master Plan can be accomplished and to what extent those objectives will have to be modified.

More than 50% of the US\$ 6 million provided by the donors for the period 1981-85 remains unspent in November 1984. The review team has learned that some of the reasons for this situation are rooted in rules and regulations beyond the control of BARRI. At the same time it was difficult for the team to tell if all of the projects had been equally disadvantaged or if some were hurt more than others.

Table 1. Estimates of BRRRI Expenditures 1982-83 and 1983-84.

<u>Expenditures</u>	<u>1982-83</u> (1000 Tk)	(%)	<u>1983-84</u> (1000 tk)	(%)
<u>Take Budget</u>				
Pay & Allowances	8,007		10,448	
Operational Expenses	<u>10,001</u>		<u>6,874</u>	
Capital	18,008		17,322	
Total	9,257		19,456	
	27,265	(61)	36,778 <sup>3/</sup>	(63)
<u>Gran. Expenditures</u> <sup>1/</sup>	16,047	(39)	21,229	(37)
Grant & Tak Budget <sup>2/</sup>	43,312	(100)	58,007	(100)

1/ Combined grants for Rice Research and Training Project, Phase II from USAID, CIDA, Australian Government and Ford Foundation over 1981-85 totalling US\$ 6,622,000. Exchange rate of US\$ = 20 taka

2/ These grants do not include the following foreign exchange grants: C\$ 230,000 from IDRC over a period July 82-June 85; US\$ 617,176 from FAO over a period March-May '82 and Feb. '83-Feb. '85 (unknown amount from ODA - completely handled by ODA). The rough annual average of the IDRC and FAO grants is US\$ 282,000 (Tk. 5,646,000).

3/ Does not include Tk. 4,225,000 over the period July '83 to June '84 from P1-480 funds.

In order to get an overview of how BRRRI spends its money and, by implication, some indication of the importance given to different areas of research, we asked if the annual budget was divided up in various ways.

One estimate which was available was the percentage of total BRRRI salary and operational expenses which were spent in the 5 regional stations. In 1982/83 and 1983/84 this was 24% and 32% respectively. These figures should be used cautiously as regional station expenditures cover full operating costs and, therefore, include costs for producing seed for sale, as well as research expenditures.

Further breakdowns of expenditures were not immediately available because amongst other things, operating costs for each division came out of a general budget and are not allocated by division, task force or between on-station and on-farm research.

As another way of estimating how scarce research resources are allocated, the review team asked if there were any estimates of the way research staff spent their time between on-station and on-farm research; between regional station, and Joydebpur; between different types of research and extension committee activity. However, this type of analysis has not been conducted

at BIRRI and there was not time during our review to prepare rough estimates on these types of breakdown.

The review team recommends that BIRRI start using the budget not only for accounting purposes but also as a tool in relating expenditures (past and planned) to declared areas of research priorities. We are not suggesting a high degree of detail, which would be cumbersome and a waste of time; however some broad relating to financial and time budgets to such things as on- and off- station research, between central station and regional station research and between different major thrusts of the BIRRI program could help in research planning and management.

## II. Research Organization

It is natural that research organization at BIRRI was largely influenced by the IIRRI model. Now that BIRRI's role and contribution to the overall rice production efforts in Bangladesh is beginning to take shape, it is appropriate to review alternatives for reorganization that can strengthen BIRRI's unique identity and contribute to improved effectiveness.

The team recommends that objectives of reorganizing BIRRI's research effort include the following:

1. Reduce the existing duplication and overlapping of research now conducted in different divisions;
2. Improve the coordination of efforts across divisions;
3. Reorient research away from the objective of recommending a complete package of recommendations to developing components for Farming Systems that farmers can adapt and adopt according to their own unique situation; and
4. Provide a better mechanism for determining research priorities.

One possibility for achieving these goals is to organize the existing research into four program areas - varietal improvement, cropping systems, fertility, and pest management. Each should have an increased focus on particular agro-economic zones and an improved mechanism for on-farm research and diagnosis of priorities for improved technology. The research at the regional stations should be organized around the same four program areas.

The present proliferation of task forces stretches BIRRI's core research resources over diverse objectives. The proposed reorganization could be accomplished without changing the composition of divisions but by retaining task forces only in the four areas mentioned. Moreover the pest management task force should conduct its work primarily through ad-hoc subcommittees that would focus on specific impending pest problems that threaten sub-stational crop damages. Appropriate pest control strategies often require joint action by farmers which should be coordinated via the extension network.

RESEARCH PROGRAMSVarietal Improvement

Variety improvement involves the largest group of BIRRI personnel and is composed of plant breeders, plant pathologists, entomologists, physiologists, soil fertility, rice quality, on-farm testing and cropping systems scientists. The three major seasonal types of rice in order of acreage are Aman, Aus, and Boro. Varieties such as BR numbers 1,2,3,6,7, 8,9 have been widely accepted and now account for 80% of the 4 million acres of Boro crop. BR numbers 12,14,15 and 16 were just released for this season. For the large T.Aman (wet season) crop of about 10 million acres, BR4, BR10 and BR11 appear promising and have begun to gain a foothold. In addition to being HYV types, they are weakly photoperiod sensitive and if sown early in a favorable rainfed environment out-perform local types. However, they cannot compete with local strong photoperiod sensitive forms such as Nizersail if sown late and subjected to adverse conditions.

The Team recommends that an ad-hoc committee should be set up to study the traits of the variety "pajam" since it covers the largest acreage of any single variety (traditional or HYV) and is grown almost any time of year. It is not a particularly high yielder and has weak straw. Identification of its desirable traits (such as grain quality, market price, adaptation) might permit breeders to focus their efforts on selection of similar characteristics in segregating material and enhance the chances of widespread adoption of future improved varieties.

Four deepwater entries are being considered for release based on their higher yield and wider adaptation. Two are of hybrid origin and the other two are selections from local varieties. These have good tolerance to water depths of up to 12 feet.

It appeared that yield data on the deepwater rice farmer field tests are not as extensive as desired. Task Force members pointed out some difficulties in obtaining reliable results under stress conditions. Lack of personnel and transport add to the problem. The review team raised the question of why the farmers' variety was not included as a check in on-farm tests. Several answers were given but it was not clear whether the check variety used was representative of the specific farmer variety or as a general check. The review team recommends that the local check be the actual variety the farmer is growing adjacent to the trial site.

Two of the team members attended the task force meeting for the upcoming Boro crop. There was good participation by the senior members of the task force on items such as the proposal to switch breeding emphasis from problem area disciplines to major cultural types such as T.Aman, Boro, Deepwater and Aus. This would permit breeders to sharpen their focus on specific cultural types. The review team supports this change of emphasis as it is in keeping with a general reorientation towards client group research, i.e., addressing the problems of farmers who face different agro-climatic and socio-economic situations. This change of breeding principles will result in a change of the workload of task force members who are performing screening work service.

On two occasions outside reviewers have suggested such a change within the past two years. As was stated in the last review report, "it is not within the team's mandate to suggest how BARRI's breeding effort should be organized;" however, it is recommended that the breeding efforts be oriented around the major cultural types by assignment of one or more breeders to each major cultural type based on priority of need, importance and available resources.

Since the senior breeder clearly stated that future priority would be placed on improvement of the rainfed T.Aman crop, it is assumed that greater emphasis will be placed on photoperiod sensitivity, flood, cold, drought tolerance, and grain quality in the development of new high yield potential genotypes.

If regional stations are better staffed and equipped, as they should be, it should be possible to field screen experimental lines for many of the stress characteristics outside BARRI and thus not increase the workload of the center except that the Joydebpur-based breeders will require additional support for travel to the respective regional stations. In the future, as a greater percentage of BARRI's research trainees are assigned to regional stations we would expect the regional station leaders to directly relate the major part of his program to his regional objectives.

Furthermore, the review team believes that the breeding program will be enhanced if breeders are encouraged to increase the testing of their material under farm conditions. The magnitude of information lost from the trials during the past few years must be of concern. It is, therefore, recommended that every effort be made to remove the travel restrictions which hamper the breeding effort.

#### Plant Physiology

Although Plant Physiology provides assistance to the Cultural Practices, Soil Fertility and pest Management task forces, the major and most important effort is aimed at development of screening methods for stress situations related to variety improvement. The work includes photoperiod sensitivity, tolerance to high and low temperatures, drought and flood. All of these can be major constraints to production on rice and are not easily controlled other than incorporating the desired traits in improved breeding material. The major accomplishments to date appear to be in the areas of drought and flood tolerance. Photoperiod sensitivity can be quickly detected by late planting in December which results in only partial flowering of sensitive genotypes.

The division has been weakened by loss of staff to Microbiology and the addition of tissue culture into the program. In view of plans by the rice breeders to increase emphasis on the rainfed T.Aman crop, the physiology staff will be under increased pressure to screen for the above traits with limited staff. We recommend that as a partial solution research assistants should be trained on field screening techniques and reserve sophisticated procedures for the elite breeding lines after they have passed preliminary screening by the trained research assistants.

### Entomology

Approximately 40 percent of the staff time is devoted to screening breeding materials for resistance to major rice insects such as brown plant hoppers, gall midge, thrips, and stem borers. Although gall midge is a serious problem, progress is slow and the status of biotype is not clear. Some resistance to the yellow stem borer has been identified but this has not yet been bred into improved varieties. Promising materials carrying resistance to the brown plant hopper are nearing the point of release for the Boro crop.

Entomologists have found that losses due to stem borers can be reduced by use of light traps. Farmers have been encouraged to install light traps in their fields and this technology is being accepted by a number of farmers. Results were reported to be quite good. Researchers have also demonstrated that if rice stubble is cut short more borer larvae are destroyed, thus reducing the population.

Insect monitoring studies have shown that most of the rice insect populations build up in the southern part of the country during the winter months and move north as the Boro crop is maturing. Alternate host plants for the brown plant hopper include aquatic weeds and azolla. Parasitism of brown plant hopper averages about 25 percent. A study found that the insecticide Mipcin was relatively effective in destroying BPH eggs. Efforts are also underway to find cultural control practices such as stubble burning and flooding fields as well as natural plant materials to reduce rice insect populations.

Entomologists should continue to provide a screening service to the plant breeder as host plant resistance is the most advantageous way to control rice insects. More effort is needed to locate sources highly resistant to the rice gall midge and hispa since they can cause severe yield losses. Monitoring of the most economically important insects should be a continuing process to alert farmers and the government to potential serious problems. Adequate transportation and other travel costs should be provided whenever the need arises.

### Plant Pathology

About 40 percent of the division's efforts are devoted to screening breeding materials for resistance to 11 of the more important pathogens that adversely affect rice production. The most serious diseases are bacterial leaf blight, stem rot, tungro virus and sheath blight. Good resistance is available for all of the above diseases except sheath blight for which only moderate resistance has been found. Some chemical sprays for sheath blight are effective but cost and availability limit their use. Research at BRRI and in other countries has shown that high levels of nitrogen predispose rice plants to sheath blight attack thus offsetting some of the beneficial effects of fertilizer.

Ufra disease, caused by a nematode, is especially serious on deep-water rice in Bangladesh and other Asian countries. More recently, it has begun to spread to the low land rice in Bangladesh and is presenting a serious threat to rice farmers. The review team was impressed with progress on identifying high levels of resistance to the ufra nematode.

Some local types such as the Ryadas showed no serious damage whereas nearby susceptible material was completely destroyed. The team recommends that top priority be given to screening other material for resistance. Hybridization of resistant parents with susceptible but otherwise good varieties should be speeded up. BIRRI is in the forefront on this problem including the beneficial effects of zinc and potassium to minimize urea damage.

### Rice Cropping System Division

The Cropping Systems Division has responded to the challenge of developing new technology to whole farm situations in a most constructive way. They have been able to minimize obvious difficulties in mobility and communication to develop and test systems suited to the following agroenvironments;

1. Rainfed, flood free rice lands with minimum 200mm rainfall for 5 months (HYV transplanted aus followed by HYV T.Aman established with minimum tillage and short turn around);
2. Flood free deep tubewell areas (HYV Boro or wheat, follow or green manure, HYV T.Aman);
3. Low rainfall Barind tract areas (gram + barley, fallow, HYV T. Aman; and
4. Deepwater rice areas (potatoes, sesame, deepwater rice or mixed aus and deepwater rice).

The work was made more significant by the team's ability to recognize and test at least some of the limiting factors in their systems.

### Systems

The group will need to ensure full coordination with other cropping systems and farming/work, both inside and outside of BIRRI. The supplemental irrigation studies of the agricultural engineering division are highly relevant in developing cropping practice recommendations. Assistance from the Economics or Economics/Statistics Division should also be sought in identifying the risks of alternative cropping systems for particular agro-climatic zones and groups of farmer clientele.

In a few instances the team found that there was good collaboration between BIRRI's cropping systems program and the cropping systems, farming systems and on-farm research projects of other institutions such as BARI. It is strongly recommended that this collaboration, especially at the regional stations, should be encouraged.

Strong links have been established with the extension service. This must be maintained and strengthened, not only for uptake of the technology but also to develop a free flow of information back to researchers. The cropping systems group must not only use technology in the development of a system but also be directly involved with researchers at the Institute in decisions or practices for the development of new technology.

The Team recommends that the cropping systems program be strengthened at each regional station. The program should be broadened so as to include emphasis on the development and promotion of suitable components (for example, the development and testing of varieties, time of planting, and technologies for different levels of management). The team believes that the agronomy and management practices research of ERRI's adaptive research and cultural practices program should more closely cooperate with the cropping systems program.

The team also suggests that each regional station use at least one on-farm location of the cropping systems program as a training location for extension staff, such as block supervisors and subject matter officers. By participating in the work of the cropping systems research program, such as conducting preliminary and adoption surveys, and different types of on-farm trials, the extension staff would be given a sound understanding of how to gain information on farmers' problems and how technologies are developed for extension recommendations.

A diversification in the approach of this division was evident in its establishment of a one-acre experimental project on a high-land condition at Channapara of Sreepur, a few miles north of Joydebpur. This is in ERRI's pilot area. They are testing several non-rice component crops following rice. This could be a meeting point of various research organizations such as ERRI, BARI and BARD, and the extension department. It is recommended that the Division continue with this work but that there be continued liaison with the appropriate BARI division to ensure appropriate technology and more effective use of limited research resources.

#### Agronomy Division

The Agronomy Division has obviously been hampered by discontinuity in staffing, particularly at the leadership level and this has inevitably led to a disjointed program. Despite this limitation, the division has conducted a reasonably diverse program since the last external review. It has concentrated on tillage systems; seeds technology; seedling and planting practices; organic and inorganic fertilizer technology; and weed ecology and weed control.

New technology has been evolved. For example, it was shown that transplanting one row of deepwater rice after every three rows of Boro in deepwater rice fields increased total farm productivity by more than fifty percent. It has also been demonstrated that shifting the date of planting of Boro rice from mid December to mid February gave higher economic returns due to lower irrigation costs, despite decreased crop yields. Several experiments evaluated the impact of seedling age at the time of transplanting on production performance.

One of the concerns of the review committee was the lack of apparent criteria for selecting agronomy research priorities. It was also not clear that research topics were based upon field surveys and a field diagnosis of farmers' actual circumstances. We recommend that the agronomy division give greater emphasis to farmer problem diagnosis and to developing and testing new technology off the research station. The work must also be

evaluated within the context of the whole farm system for farmers in different agro-climatic and socio-economic circumstances. It therefore should be conducted in close cooperation with the cropping systems group.

There appeared to be considerable overlap between the cultural practices task force and the fertility management task force and also between the agronomy division and the soil fertility and management division in research on fertilizers. Cooperation between these two divisions must be fostered if limited research resources are to be used more effectively. We recommend that ways be found to consolidate research in this area.

The Agronomy Division must be strengthened, particularly on regional stations, if it is to provide a useful service. It must clearly define its priorities and develop a close working relationship with the cropping systems and soil fertility groups. The division must also develop a clear commitment to improving agronomic practice on farms within the framework of a whole farm system.

#### Soil Fertility

Soil fertility - agronomy scientists have made a significant impact on the potential for increasing rice production through the identification of soils deficient in zinc and sulfur. The zinc problem is much more widespread than first thought. Furthermore, studies have shown that potash fertilizers requirements and phosphorus to some extent are not necessary for many soils. Such information can amount to significant savings to farmers who otherwise might fail to supply critical elements such as zinc and sulphur and waste meager savings to purchase unneeded potash and phosphorous fertilizers.

Although much good information on plant nutrient deficiencies in Bangladesh soils has come from the soil research program at BRRI the review team suggest that more attention be given to these matters. The team felt that there had been a preoccupation with breeding for improved varieties without sufficient attention to the development of production practices needed to capitalize on varietal yield potential. The team recommends as follows:

1. Soil samples and other site information should be taken from all experimental sites and the soils should be analyzed in BARI's lab; these analyses would be in addition to any analyses made at BRRI. The objectives should be to see how representative the experimental sites are of different agroclimatic conditions in Bangladesh before recommendations are made to farmers based on the information. Also all of the breeding plots should be properly fertilized. Soil test information should assist in the decision about quantities of fertilizer to use.
2. All on-farm test locations should be selected with the help of soil survey personnel (SRDI) to identify the soil types and land development units. Sites should be selected to represent the different major agroclimatic conditions in Bangladesh.

3. All on-farm soil fertility trials should be set up under the general coordination of BARI's Soil Test Crop Response Correlation project to insure relevance of the information to farmer recommendations.
4. Promising rice varieties should be put through a "a maximum yield" type of test where nutritional and other constraints are minimized in order to get an indication of potential yield.

#### Economics and Statistics

Most international agricultural institutes and many national research institutes have organized themselves to include a separate economics department. The primary responsibility of these departments are to assist the other departments in developing technologies that are appropriate for many diverse physical and economic situations. This is best done by documenting, understanding and explaining actual farm practices. Largely as a result of interdepartmental "constraints" research, IRRI scientists came to realize that their earlier recommendations were only appropriate for a minority of farmers, and they increasingly oriented their research efforts to accommodate lower levels of management intensity to effect resilience in the face of stress, pest and disease problems and soil deficiencies. Breeding and other technical programs have also started to define specific groups of farmers for whom technology is being developed.

In BARI the response to constraints and adaptive research has been disappointing. In the face of evidence that many farmers either do not adopt BARI varieties or choose not to follow recommended cultural practices, the tendency is to blame government for failing to provide credit and inputs at low prices, landlords for failing to take proper interest in agricultural development, or to some other third party. Rarely do the scientists take responsibility for learning the limitations of their recommendations for the wide range of ecological conditions, risks of crop damage, and the special circumstances of their farmer clientele. There is no more important role for the economics division than getting this message across.

Instead of directly accepting its primary mission of helping to develop appropriate technology, the economics department has allowed itself to be diverted by diverse and largely uncoordinated and unrelated surveys, including a massive marketing survey. The Review team recommends that the department should totally reexamine its program, cancel many of its current plans, cut its losses on the marketing survey and get back to its primary job of helping scientists to understand and respond to the problems of their clients, who operate in different agro-climatic and socio-economic circumstances.

The team recommends that the research of the economic division be reorganized into two main programs. The first, which might be called farming systems research, involves diagnosis of farmer problems and participation with breeders and other scientists in designating research priorities for promising lines, cropping systems, and cultural practices. It is important that economists be involved at the initial stage of choosing research priorities so that research is directed at increasing

actual, not potential, economic yields. Farming system research also involves economists working directly with scientists in monitoring and adoptive surveys. In some institutions economists are seen as the person who comes along at the extension stage to compute economic recommendations. It does not take any special training to compute a benefit cost ratio, and to limit the contribution of social science to this mere computation is a waste of economic expertise and does a major disservice to farmers.

The second major research program should be aimed at national issues that relate to BRRI's research strategy, their recommendations to the extension network, and to general rice production and marketing issues. For example, if ZADC were contemplating more use of complex fertilizers, it would be appropriate for the economics department to show, on the basis of existing studies, that such practices are uneconomic. To conduct trials would certainly be a waste of scarce research resources. If BRRI policy makers believe that national rice yields are constrained by absentee landlords and other land tenure issues, then it is appropriate for the economics department to study these issues directly. Indeed, BRRI might well commission a study on the role of prices, land tenure, farm size, irrigation and other farm characteristics on adoption of varieties and of cultural practices. This study should be conducted by BRRI economists with the assistance of economists in other institutions. Since similar studies have been carried out in other countries and are continuing in Bangladesh, much of the work would involve a review and interpretation of secondary evidence.

The department should also provide a monitoring and information service on farm prices, wages, and input prices. This can be done relatively cheaply by collecting information from other agencies and supplementing that information with small cross section and longitudinal surveys of selected (accessible) areas to the central and regional stations.

The effectiveness of the agricultural economics division in BRRI has been reduced by the policy of appointing agricultural economists to other divisions such as the rice cropping systems and agricultural engineering division rather than to the economics division. While the team fully supports the idea of economists working with other divisions, it is important that the agricultural economics staff interact amongst themselves and the division take on a coherent and self-strengthening orientation. At present the merger and fragmented economics staff have little impact on individual projects or on overall research policy and programs. With the planned strengthening of the regional stations it will also be essential that economists are located in these stations, as part of regional multidepartmental teams.

In spite of the lack of a Ph.D. holder on its staff, the statistics division has demonstrated capable leadership, familiarity with the state-of-the-arts in the literature and research methodology, and good execution and presentation of research. However, most of the basic research on statistical procedures is better done elsewhere. For example, research on the optimal size of crop cuts has already been done at IRRI, and it

is hard to see how additional research at BRRI on this topic will be of much help to Bangladesh farmers.

On the other hand, the proposed risk analysis can be of considerable help to BRRI's breeding program and other aspects of its research program. By identifying the primary components of risk in particular agro-climatic zones and for particular economic environments, this research can help pinpoint priorities for breeding and recommended cultural practices that will be most effective in reducing risk and improving average profitability of recommended practices. Risk analysis can also help explain why some farmers choose not to follow recommended cropping systems and cultural practices.

Many of the presentations of other divisions reflected a lack of understanding of the concept of statistical significance. Increased involvement of the statistics division with experimental design and interpretation of data appears warranted.

In light of the overlap of the objectives of the statistics and economics divisions we recommend that their research programs be closely coordinated, especially as regards developing a critical mass of Farming Systems capability.

#### Adaptive Research and Training

##### i) Training

BRRI conducts three major categories of training:

- 1) Long term training of 4-month duration to produce rice production specialists;
- 2) Short-term training of 3-week duration on rice production techniques; and
- 3) Special courses of 1-day to 2-week duration.

The long-term training courses are designed to "train the trainers" in rice production techniques. In 1983 an important innovation was introduced to BRRI's program by which new recruits to BRRI attended the 4-month course and covered, in addition to rice production training, research methodology and management.

The 3-week and special courses cover such topics as rice production techniques, cropping systems, irrigation and water management, agricultural marketing, administration and accounts.

The team was impressed by the training program. It is responding, in an innovative way, to the rice-related training needs of Bangladesh. The division should continue to receive a high priority in BRRI's program and have the participation of senior BRRI staff. In the future the team believes there will be a growing need for training programs based at regional stations. In these training programs, the field sites and programs

of on-farm research activities should be used. At Joydebpur and, more importantly, at regional stations the team suggests that there be as much integration as possible of BIRRI's training programs with other institutions, such as BARI.

Now that the training program has been operating for several years, we suggest that there be some systematic monitoring and follow-up surveys to determine what types of training have been most useful to different groups of clients. We also recommend that BIRRI cooperate with other institutions in providing training in farming systems research.

The recently-established Institute of Post-graduate Studies in Agriculture (IPSA) located at Salna, near the BIRRI headquarters, is expected to fulfill a part of the requirement that was underscored by BIRRI Review Mission of 1982, to provide the kind of post-graduate instruction and research training as required for agricultural research scientists. This will help reduce Bangladesh's dependence on overseas training. It is encouraging that, beyond a small number of core-staff, BIRRI, BARI and BARC scientists are listed as its ex-officio teachers. We recommend that BIRRI make use of these new facilities. We also support any move for BIRRI to become more involved in teaching and supervising students at the Bangladesh Agricultural University.

#### 11) Adaptive Research

The adaptive research program includes Advanced Lines Adaptive Research Trials (ALARTs), Farmer Variety Observational Trials (FVOTs), Soil fertility trials, and bench mark and follow-up surveys. These are part of an on-farm research program, which is conducted in different parts of the country. The adaptive research program should be very important to BIRRI but appears to be relatively weak at present. The review team recommends that BIRRI either strengthens this division considerably or integrates this adaptive research work into an increased program in other divisions. As regards agronomy and cultural practices there is considerable overlap of purposes and role of the program of the Adaptive Research section with, for example the work of cropping systems, agronomy, soil chemistry, agricultural economics and cultural practices. More rationalization of this type of research is needed as BIRRI's scarce research resources are being stretched over too many uncoordinated projects.

#### Agricultural Engineering

The Engineering Division currently comprises three sections: Irrigation and Water Management, Post Harvest Technology, and Machinery Development. Staffing consists of 27 professionals and 34 support personnel. The 1984 budget was slightly more than 5 million taka.

Major emphasis in the division focuses on the water management and machinery development activities. The post harvest technology section has concentrated on development and testing of small-scale drying

technologies, but with a smaller commitment of resources. The division has a fully equipped workshop for production of prototype models and laboratory and field facilities for testing equipment.

#### Irrigation and Water Management

The division has demonstrated considerable initiative in conceptualizing and implementing water management research. The collaborative field research project involving BARRI/BWDB/IARI has demonstrated that better allocative methods improve water use efficiency and increase paddy yields. The proposed expansion of this methodology to additional areas is strongly endorsed as is the training of irrigation engineers for planning and implementing these projects. The team recommends that field surveys be undertaken to monitor the economic performance of the modified management methods.

Research to estimate economically efficient water requirements for various farming systems should also receive high priority. Complementary research on soil-plant-water relationships should be carried out in close collaboration with the Cropping Systems Division.

#### post Harvest Technology

The work of this component of the division has focused almost exclusively on efforts to develop improved drying methods. It is generally agreed that increased production places greater stress on existing mechanisms for handling, processing and marketing rice. There is, however, no evidence that clearly identifies which operations are the critical bottlenecks. Work on farm-level dryers has a long, unproductive history in Asia. There exists no outstanding example of small farm-level paddy dryer acceptance and use in the developing countries. A drying problem exists, but it must be more clearly defined before a major effort is made to develop or introduce drying technology for which there may be no market. Analytical field surveys and benchmark engineering work are needed on small-scale rice parboiling and milling technologies in Bangladesh to focus research priorities before any subsequent machinery development activity is undertaken in this area.

#### Machinery Development

The role of farm machinery in Bangladesh must be examined with care. Low cost innovations which augment scarce resources such as water and land are to be encouraged. The division's development work on water pumps, fertilizer placement and rice drying machinery meet this criteria. Conversely, the need for mechanized land preparation, harvesting and threshing equipment is not clearcut.

Power equipment substitutes for animal and human labor. The impact on production and the distribution of income has been analysed in some recent field studies in Bangladesh, but is not well known. A prevailing hypothesis suggests there exists a farm power constraint between the Aus and T.Aman seasons affecting eight million hectares. A careful review of existing studies and a well designed field survey by Engineers and Economists is required to focus research and development activities in the machinery development section and to ensure acceptance by farmers.

### Findings and Recommendations

1. The Division should be complimented for its leadership, initiative, and aggressive pursuit of research, particularly in irrigation and water management. The recent removal of responsibilities for maintenance and repair services at BRRI has increased the level of resources available for research related activities.
2. Physical facilities for workshop, laboratory and office staff appear to be adequate. Transport to conduct research at remote sites continues to be a constraint.
3. The size of the professional and support staff appears to be small in relation to the large number of projects which the division currently has underway or proposed, particularly in the machinery development section. The team recommends that a methodology be developed to establish priorities in the selection and justification of projects. Prime factors economic viability of potentially labor-saving machinery should be ascertained in view of the likelihood that the social opportunity cost of labor is less than the market wage.
4. It is recommended that the division establish a formal relationship with the International Irrigation and Water Management Institute in Sri Lanka to avoid redundancy in research and enhance the communication of ideas and staff development.
5. Additional empirical evidence is needed to clarify and define the design parameters for many of the machinery development projects:
  - A field evaluation of the benefits and costs of reduced turnaround time is needed;
  - Survey information on pump and tubewell installation should be collated to clarify the type of pump designs needed, their performance, costs and compatibility with local manufacturing capabilities; and
  - A feasibility study is needed to determine the potential benefits and costs of utilizing the 150,000 diesel engines currently employed on lowlift water pumps to power small tractors for tillage, transportation and threshing.
6. The division currently undertakes design, development and testing activities. It does not, however, have a viable industrial liaison component. Analysis of the economics of machinery manufacture and markets is essential if machinery designs from the division are to reach local manufacturers and become available to farmers. Industrial liaison should also involve on-farm testing of equipment and the development of training activities for manufacturers and extension personnel in conjunction with the Adaptive Research and Training Division.

### Rice Technology

The Rice Technology Division has only a few scientists to work on all aspects of rice grain quality. A major function of the division is to evaluate the physical, chemical, cooking, eating and processing quality of rice varieties and lines provided by the plant breeders. Other important projects study the pre- and post-harvest factors influencing rice quality and nutritive value.

The division is doing valuable research with limited resources. It should establish firm priorities for its research to make best use of these resources. This will be particularly important until the division is strengthened by the return of scientists now on study leave. Milling quality is currently the most important quality parameter used by the breeders for selection. However, the review team was informed that one of the reasons farmers continued to grow lower yielding, local T.Aman varieties was because they have preferred quality. High priority should be given to evaluation of farmer and community quality preferences and the importance of these in the acceptance of improved varieties. It is likely that breeders will need to place more importance on quality in future and they will require guidance from the rice technology division on the most important characteristics for selection.

The division has demonstrated a desire and expertise in evaluating the influence on quality of practices at the farm, village and commercial level. It is to be hoped that they will develop the lines of communication back to these groups so that the new technology can have an impact on improving rice quality, economic return, and nutritive value at all levels. For example, the experiments that determined the optimum time of harvest as 32 to 35 days after flowering in all seasons may be important. If the findings deviate from current practice, the work should be confirmed at the farm level and results communicated to farmers. Similarly, the important work on parboiling practice, the elimination of odours in rice caused by poor parboiling techniques and studies on milling technique, should all be communicated directly to the milling industry.

There is an important role for the involvement of an economist in the work of the rice technology division, especially in the diagnosis of current problems and farmer behaviour and in the development of technology which is commercially viable. An analysis of the likely impact of technology should be undertaken before proceeding with studies likely to form a substantial part of the program. It is therefore recommended that BRRRI economics staff participate more substantially in the rice technology program.

Of great importance, is a recommendation that the rice technology division sample the physico-chemical properties of a representative sample of preferred varieties from all growing seasons. This will provide breeders with important information for selection. In addition it is highly recommended that this division maintain a strong liaison with the plant breeding division.

### Publications and Public Relations

The Publication Division should be regarded as one of the most important in the Institute. Success in disseminating research results and certainly the success of the institute as perceived by outsiders is largely dependent on the flow of publications. This is particularly true of the annual report, which should be the primary embodiment of the major research results of the institute. The fact that production of the annual report has fallen approximately four years behind schedule is a matter of serious concern.

The Publication Division has obviously been hampered by shortages and sickness of editorial staff over the past two years. This has been compounded by delays in approval for publication. We were assured that most problems had now been resolved and progress is being made to clear the backlog. Despite its obvious difficulties, the Division has produced some valuable publications. It has also been involved in the production of radio talks for extension purposes and in catering for many visitors to the institute.

The printing capability of the Division is soon to be enhanced by the installation of a printing and collating facility. This will improve the quality of printed material such as reports, technical notes and training aids. It will also facilitate the much-needed newsletter to be directed to extension workers. The review team recommends that the newsletter be printed monthly rather than quarterly. Timely information is needed by extension workers. The Newsletter should be drawn up with extension staff.

The team recommends that systematic monitoring and follow-up studies be undertaken to determine if publications have been useful to the clients for whom they are primarily produced. This is particularly important for publications directed to farmers and extension personnel.

Given the backlog and other production plans (see the Division's workplan for 1985), means for lightening the workload on the technical editor need to be sought. In the short run, given the urgency of the situation, means should be explored for obtaining additional help in some of the editing and entrepreneurial aspects of dealing with outside printers. However, the review team recommends additional editorial staff be assigned to this division. If the remaining tasks of publishing the 1980, 1981 and 1982 annual reports were turned over to an appropriate third party, then the technical editor could concentrate on the more important jobs of publishing the 1984 and 1985 reports and the other publications plans.

### Library

The two main policy issues for the library are how to improve its acquisitions and how to increase effective use of the materials already available.

The library committee has done a good job of acquiring those items from the IRRI accessions list that are of relevance to BRRI scientists and of responding to additional requests from the various division heads. Additional suggestions should be solicited by BRRI staff, especially those in the regional stations, for materials of general and specific relevance

to BRRI's research program. Suggestions could also be solicited from other agencies and interested individuals.

The library committee should explore possibilities for enhancing the use of its collection. In particular, a mechanism should be found for rotating some of the key materials amongst the regional stations. This may require acquisition of additional copies of some materials, and copying of others. A duplicating machine should be purchased and be available in the library itself. Ad-hoc committees should also be convened occasionally to generate lists of reference materials on particular topics of interest (e.g., on the role of farm size and tenure in the adoption of HYV's and recommended cultural practices).

### Training and Staff Development

The purpose of the training program is to provide BRRI staff with the opportunity to develop their research and analytical skills and, in so doing, provide a resource for excellence in rice research.

All degree scholars abroad when the SFYP began in 1981 successfully completed their programs and returned to BRRI.

All nine Ph.D. scholars and 27 MS scholars that were provided for in the SFYP have been selected and are abroad with the exception of one Ph.D. scholar who should start early in 1985. Eight MS scholars have completed training under the project funding. The high completion rate of the scholars selected for overseas training indicates that the selection process has been sound and effective. The Review Team was pleased to learn that the retention rate of scholars on their return is indeed high. Short term training at IIRI has generally proceeded as planned although some difficulty is now being experienced in recruiting trainees from within BRRI for these courses as attendance may jeopardize opportunity for higher degree training for five years. This is due to a new government 5-year travel restriction following any foreign travel exceeding 3 months. It is recommended that this problem be reviewed to determine if shorter term courses can be conducted or whether courses can be conducted in Bangladesh.

The training and staff development programs are extremely important. They have also had a disruptive effect on some BRRI research projects as a high proportion of BRRI staff are absent for considerable periods. In addition, complete dependence on overseas training does little to develop the university institutions in Bangladesh. Research and teaching programs between the Bangladesh Agricultural University and BRRI should be strengthened. The formation of a post graduate college near Joydebpur is an interesting development and should be encouraged. It is recommended that, since the academic standard at BRRI is now at a reasonably high level, the proportion of scholars abroad for training at any one period could be reduced slightly.

The scientific staff at BRRI has been strengthened by the staff development and training program at all levels. It has been nurtured, however, by the Director. He has recognized the needs of the staff to develop their research program and accept responsibility. This philosophy must be encouraged at all levels within the institute - from the Director, through

division heads to the section leaders. The review team noted that the delegation of research planning and operation was greater in some departments than in others. It is recommended that greater attention be given to training programs which develop skills for the planning and management of research.

### Station Development

1. Joydebpur - The development of physical and land facilities at Joydebpur are now well advanced. The well designed laboratory and office accommodations are soon to be enhanced by a germ plasm storage and genetics facility supported by the Japanese government. Staff housing has been constructed and additional residential accommodations are nearing completion. The construction of deepwater tanks at Joydebpur is an important addition to the facilities and will assist the scientists who work in this difficult area.

Building program and facility development at the regional stations are continuing at a much slower pace and will be discussed separately for each station. The review team feels that these stations are of extreme importance and strongly recommends improved facilities for each of the stations being considered.

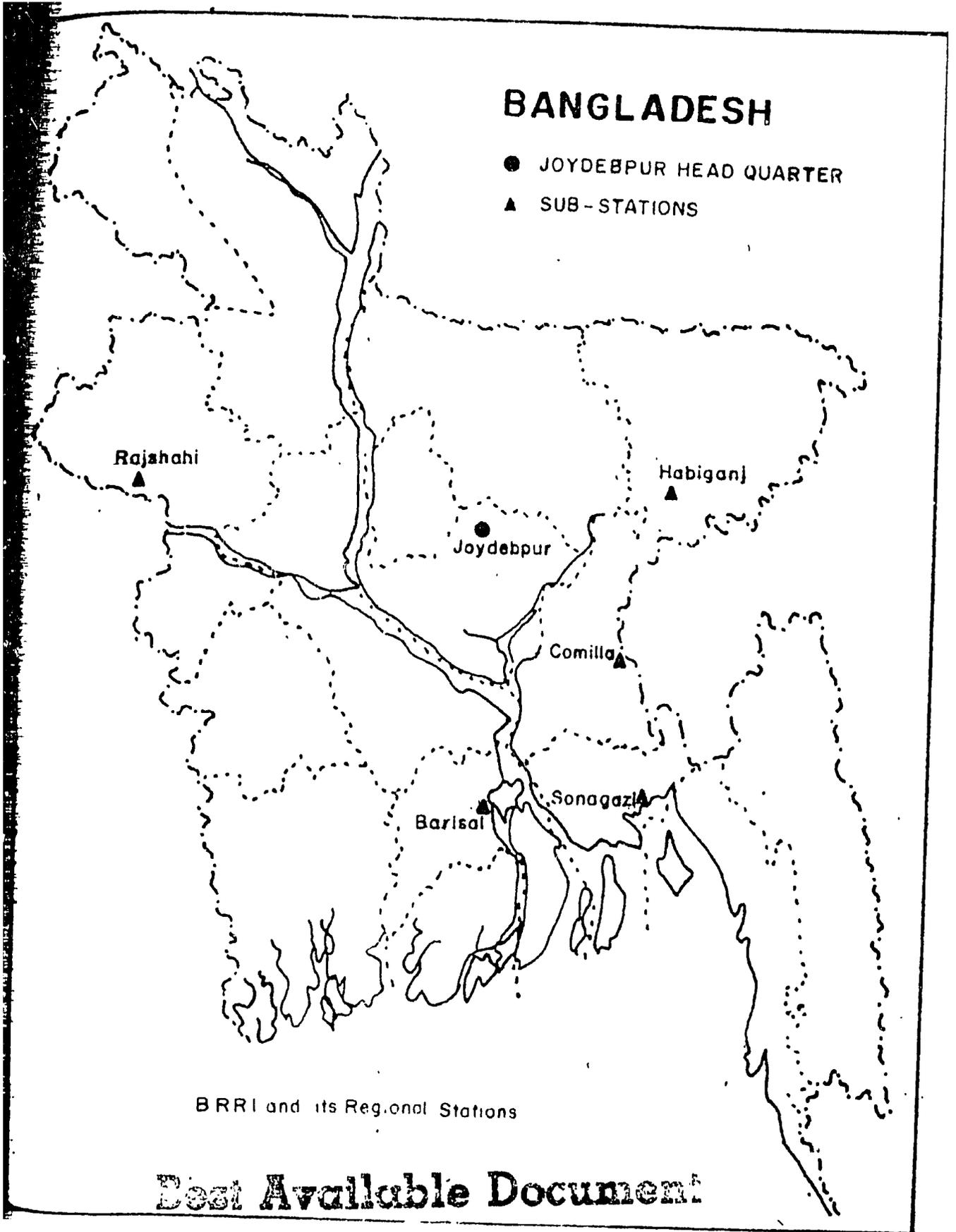
### 2. Regional Research Stations

BARRI has five regional stations located as indicated in Fig.1. In the proposal prepared by BARRI in collaboration with IRRI for donor assistance for Phase II of the Rice Research and Training Project it was envisaged that these Regional Stations would be equipped and transportation vehicles provided by donor funds, and that multidisciplinary teams of scientists with supporting staff would be assigned to these stations to "undertake development of varieties and applied production technology designed for use by farmers cultivating 65% of the total rice acreage". It was also envisaged (in terms of problem areas) that work on deepwater rice would be concentrated at Habiganj; on coastal saline and tidal submergence rice at Barisal and Sonagazi; on drought tolerant rice for the Barind tract and adjacent drought prone areas at Rajshahi and Joydebpur; tall Boro for marshy areas at Habiganj and Joydebpur; and, tall T.Aman (lands subject to flash flooding) at Comilla and Joydebpur. In addition, a budget of \$636,400 U.S. was proposed for the establishment of two new zonal stations, one a deepwater station at Bhanga and the other in the northwest part of Bangladesh in the Tista silt region.

Four years have expired since Phase II was approved, no new stations have been established, and previous reviews have expressed concern about the rather slow development of the existing five regional stations. Therefore, each of the 5 regional stations was visited by one or more of the Review Team to assess the current facilities, the potential for development, the needs and the constraints.

# BANGLADESH

- JOYDEBPUR HEAD QUARTER
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BRR and its Regional Stations

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### Barisal Regional Station

BIRRI assumed control of this station in 1970. The station operates two farms, a headquarters farm consisting of 20 acres, 6 of which are used for infrastructure and 14 acres of cultivable land for research. The other farm, situated at a considerable distance on the other side of a large urban centre is rather hard to define in terms of size. Originally 80 acres in size it was lost due to a change in the channel of the Kirtankhola river. The land is now reforming through silting and about 40 acres are being developed for research purposes.

Both farms are subject to tidal submergence during the monsoon season and therefore are well suited to develop varieties adapted to withstand such stress conditions.

Mr. Das, the station head, has initiated a respectable breeding program and already has identified two varieties that appear promising in comparison with local varieties for the monsoon season.

Although some housing construction is underway, more buildings, staff and transport are surely needed to develop the potential of the station. It is imperative that the staff should have transport to move from one farm to the other and to the surrounding areas to conduct on-farm surveys and trials.

Barisal should not be considered a hardship center because the two farms are adjacent to a large urban center with educational and medical facilities.

### Comilla

The Comilla Regional Station (established in 1919) occupies 72 acres of which 55 acres are under cropping and the remaining 17 acres under infrastructure development - roads functional and residential buildings, drainage and irrigation canal, playground etc. The activities of the station include testing technologies developed at Joydebpur, developing new technologies for the flat land around Comilla, with emphasis on rice based cropping systems.

The station is under capable leadership, and at the time of our visit had an impressive seed increase program of new HYV for the I.Aman season. The Team was impressed with the breeding and testing program as well as with the agronomic and cropping systems programs.

The two on-farm trials visited were well designed and certainly indicated that progress was being made in the development of photoperiod HYV required for the I.Aman season. Linkage with extension was particularly well developed at this station.

As at Barisal, major constraints included lack of scientific manpower and transportation. With only a 10 year old pick-up truck, there is limited transport for on-farm research.

Habiganj

This station was established in 1934 and aside from housing, the buildings are old but well maintained. The station occupies 92 acres of land, about 60 acres cultivated and a small portion of the remaining land appears to be continuously submerged. Various water depths occur during the monsoon thus permitting research at different water levels. The Principal Scientific Officer is a Pathologist (not available at the time of the visit) with laboratory space but no equipment. Total scientific staff currently include the head of the station and two scientific officers both of whom are agronomists. Current projects include varietal development and testing of the deepwater and Boro crops, weed control and fertilizer trials, and on-farm varietal adaptability trials. Attempts are made to monitor pests and diseases. A considerable portion of the farm is used for seed production of improved varieties including improved farmer varieties.

The station has 11 bullocks, 2 water buffalo, and one power tiller. Approximately 300 farmers attended a field day during the Boro season indicating an interest in the research program.

The station is badly understaffed, under equipped, has insufficient housing for the basic scientific staff envisaged for the station and has no transport other than one motorcycle. Although only about two miles from the town of Habiganj, transportation is either by rickshaw or walking.

Rajshahi

This station was established in 1978 on 33 acres of land with irrigation facilities taken from the BARI sub-station. The station is still in the early development stage and is to be concerned with the development of varieties and technologies suitable for direct-seeded upland rice and rain-fed T.Aman for a part of the Gangetic flood plain alluvium soils.

The present scientific staff consist of 2 scientific officers who have available a jeep pick-up and a motorcycle. The breeding program is planned to start in 1985. A regional task force has been set up to decide what work should be undertaken at the station. The task force includes representation from BARI and the Extension Services and meets monthly. Participation of nearby University staff should be encouraged. The University has a strong economics department. The station is well situated for working on rainfed rice problems in drought prone areas. Cooperation with BARI is strongly recommended, particularly in the area of cropping systems.

Sonagazi

This station was acquired in 1977 with 100 acres of land of which 95 acres are cultivated and 5 acres for administrative and residential buildings. The 5 acres are separated from the cultivated land by a wide and deep canal with only a poorly constructed walking bridge connecting the two land areas. Scientific personnel consist of a senior scientific officer Mr. J.U. Ahmed with expertise in soil salinity, and one scientific officer. A second S.O. is on training leave.

The seed production component of the farm has been well developed and yields of improved HY T.Amar varieties were expected to average well above 3 tons per hectare in an area where yields traditionally are well below one tone/ha.

Research programs include breeding and testing salt tolerant rice, fertilizer trials, agronomic trials, and cropping research.

Major constraints are staffing, transport, and equipment.

One recurring theme encountered at all of the regional stations was the lack of adequate scientific staff, insufficient housing for such staff, lack of transportation, and equipment. According to the 1982 Review Report "originally it was foreseen that each regional station would be staffed by approximately eight scientists representing the different disciplines important to the area".

Our team strongly supports this concept but recommends that the minimum number of scientific staff at each station should be established at seven. Each regional station should be involved in varietal development and testing; in Agronomy; in fertility studies; in cropping systems; and in outreach which includes on-farm surveys and trials, training and liaison with the extension services, and direct contact with the farming communities. This would require a plant breeder, plant pathologist, entomologist, agronomist, soil scientist, an on-farm research officer and an agriculture economist. One of the latter two might represent BARRI on the District Technical Committees.

The team recognizes that there is a shortage of trained personnel, with many of the current staff away on training programs, but a number of the breeders, pathologists, agronomists etc. now stationed at Joydebpur should be reassigned to do their breeding, agronomy and other work at regional stations where so many of the problems affecting rice production are acute.

There was evidence that regional station personnel had not been given a clear understanding of the geographical area they were to serve with defined terms of reference. The team recommends that each of the Regional Stations be reviewed in light of the land capability units they represent. There was an indication that one station, Sonagazi, was not suitably located to serve the long-term needs of the saline area. This should be reviewed and settled.

Each regional station should be provided with adequate transportation facilities. Nine transport were earmarked for the Regional Station in the Phase II proposal and these are essential if any serious on-farm research programs from the stations are to be achieved.

The team further recommends that the proposed new regional stations should in no way restrict the full development and staffing of the existing regional stations. In the proposed extension of the BARRI/IRRI project and the reallocation of funds, sufficient funds should be reallocated to permit rapid, full development of the regional stations.

PROPOSAL TO EXTEND THE CURRENT BARRI/IRRI PROJECT

The team has reviewed the joint BARRI-IRRI proposal for extending the grant and has the following comments and recommendations.

Extension

1. The team fully supports the requested extension of the grant to June 30, 1986.

Regional Stations

2. The team recommends that priority for the use of remaining grant funds be given to the completion of construction work and the provision of equipment and vehicles to the 5 existing regional stations.

Vehicles

3. The team was concerned about the proposed reduction in the budget for vehicle procurement. With BARRI's declared objective of increasing the capacity of regional stations and proposed increased involvement in on-farm surveys, trials and other research, there is, if anything, an increased need for vehicles and transport. We recommend that all measures possible be taken to implement the Phase II program of providing transportation to scientists especially at the Regional Stations.

Scientific Equipment

4. The team does not support the proposed reduction in the budget by US\$300,955 from US\$1,225,350 to US\$844,395. The original estimates were based on what was thought to be minimal equipment needed in regional stations and in the centre for providing the wherewithall for Bangladeshi scientists to do their jobs. No case has been presented to support that less equipment is now needed. One cannot expect scientists to work under difficult conditions if minimum equipment is not provided.

Manpower Development

5. The team supports the increase in budget to this line item.

Expatriate Scientists

6. The team is concerned that the major increase (US\$409,222) in proposed expenditures is on IRRI resident expatriate scientists. The terms of the three current IRRI staff are to be extended, and a fourth specialist in rice farming systems is to be appointed in late 1984. The team recommends that consideration be given to priorities for expatriate involvement and that the number be retained at the present level of three.

Short Assignment Specialists

7. The team finds the minimal use of specialists during the 1981-83 disappointing as these short term visits were designed to give on-going collegiate support to different research programs in BRRRI. In many instances BRRRI still needs this type of assistance, rather than having resident IRRI staff. The review team, therefore, recommends that the line item is not reduced to the extent proposed.

The team supports the remaining proposed changes in expenditures

Category	<u>Proposal for Extending the Project</u>		Change
	Original Budget to 30/5/85	US\$ Revised Budget to 30 June 86	
Regional Stations	580,000	680,000	+100,000
Vehicles	391,160	215,235	-175,925
Equipment	1,225,350	844,395	-380,955
Training	1,699,200	1,849,132	+149,932
Expatriates	1,227,700	1,636,922	+409,222
Sh. term consults	370,450	202,080	-168,370
Travel	181,872	181,872	-0-
Other	41,600	11,700	- 29,900
Contingency	40,800	119,0676	+ 78,267
IRRI Charges	489,898	545,337	+ 55,439
Dhaka Office	373,970	336,240	- 37,730
Total	\$6,622,000	\$6,622,000	-0-

The Team noted that the main reductions being proposed are with vehicles and equipment. These items were high on the list of constraints  $\angle$  by the staff of BRRRI (See Appendix 1).

$\angle$ identified

THIRD FIVE YEAR PLAN AND FURTHER NEED FOR DONORS ASSISTANCE

The Review Team discussed the need for donor funding into the late 1980's and concluded that there was a strong need for support during the TFYP during which time the additional two regional stations would be established and much of the overseas graduate training completed. Although BRRI is now a viable institution and could continue if all donor assistance stopped, financial support in the training program, for equipment, for and assistance/expatriate scientists would still help build up BRRI's capability. The Review team recommends that consideration is given to the following points and procedures for the monitoring of the current project and for the drawing up of a new project:

1. There be a regular three-monthly meeting at BRRI by the consortium of all donors. This would provide a regular forum for the discussion of progress, problems and future plans.
2. In the light of current experience, any future plans must take into account predictable problems of delays in the implementation of various parts of the project, and the availability of taka funds.
3. Continued emphasis be given to:
  - a) On-farm and farming systems research
  - b) Development of the Regional Stations
  - c) Phasing out of technical assistance except in carefully identified areas
  - d) Measures to help BRRI keep good Bangladeshee scientists on the staff
  - e) Increased attention to research management
  - f) Continuation of training programs at BRRI and at a variety of Bangladeshi institutions.
4. Any future projects for donor funding should be presented in the context of an overall plan for BRRI which would include consideration of training, technical assistance, etc. from other donors, as well as a realistic projection of future taka budgets.

We recommend that BRRI and donor personnel in Dhaka start discussions on future plans immediately. The implementation of the extension of the present project cannot be seen outside of the context of what assistance may be available after June 1986.

BARRI/IRRI RELATIONSHIPS

The review team was asked to look at the relationship between BARRI and IRRI. This was a difficult task as the two are so closely interwoven, both as regards their philosophies and commitment to a single crop (rice), and because IRRI is the major source of BARRI's technical assistance and provides or helps find places for many of BARRI's overseas trainees. In addition IRRI is BARRI's agent for handling the foreign exchange component of donor funds under the stage II project. In 1982/83 and 1983/84 this made up about 40% of BARRI's total budget, so it can be seen that IRRI manages and administers a significant part of BARRI's accounts.

The review team recognized that there had been a significant two-way exchange of professional information between the two institutions and, on the whole, there appears to be a good collegiate relationship between the scientists of BARRI and IRRI.

However, the review team identified two areas where they believe the BARRI/IRRI relationship needs to change. The first is in the general area of research capabilities, methods and philosophy and the second is in the area of administration and general management.

With two rice research institutes, such as BARRI and IRRI, working on hard rice production problems, it is very difficult to determine the intellectual relationship between the two. The problem is compounded as Bangladeshis join IRRI and thus BARRI makes significant inputs to IRRI's research programs.

In the past, BARRI was the "younger sister" in the BARRI/IRRI relationship. This is now changing and the review team felt that greater attention should be given to accelerating this change. For example, BARRI should invite visiting scientists from institutions other than IRRI to work at BARRI for short or long term periods. In some areas of research, such as BARRI's new innovative and important work on the wfra nematode, BARRI should be encouraged and be given the funds to take the lead in international research in this area.

As regards future BARRI/IRRI projects, the review team were impressed by the BARRI/IRRI proposals for collaboration in Irrigation Water Management. What was distinctive about this proposal was the fact that the IRRI/BARRI collaboration was directed at a specific Bangladeshi problem, and the IRRI input had been carefully "tailor made" to addressing a current problem and to strengthening the long-term research capability of BARRI in this research area.

In the future the review team sees an important but decreasing role for IRRI technical assistance to BARRI. This should be restricted to short and long term assignments in specific areas of expertise, where BARRI identifies major gaps in its professional staff.

In the area of financial administration, BARRI should be giving attention to increasing its planning, management and administrative capacities so that it can increasingly take on the functions currently performed by IIRI. BARRI also needs to increase its administrative capacities as its relationships with other organizations and donors such as FAO, ODA and IDRC are also likely to increase in the future.

CONSTRAINTS TO RESEARCH WORK AND TRANSFER OF TECHNOLOGY TO FARMERS

The team made a request of the BRRI staff to list the most serious constraints to their research program and to the transfer of their technology to farmers. Many replies were received. The constraints have been summarized as follows with the ones more frequently mentioned at the top of the list.

A. Research

- 1) Shortage of manpower with up-to-date training and expertise.
- 2) Inadequate transportation to visit farmers.
- 3) Lack of good physical facilities and resources.
- 4) Unattractive terms of employment and opportunities for professional activity.
- 5) Some adverse government rules and regulations affect research activity.
- 6) Lack of control of labor force.
- 7) Insufficient appreciation <sup>of</sup> and incentive for good work.

B. Extension

- 1) Lack of transportation for visits and on-farm research.
- 2) Insufficient manpower to do the work.
- 3) Inadequate linkages between research and extension.
- 4) Lack of knowledge, interest and follow-up by extension.
- 5) Insufficient time for extension personnel to do the work.
- 6) Poor travel opportunities and allowances.
- 7) Lack of appreciation of the problems farmers face.
- 8) Cumbersome approval mechanisms for new varieties.
- 9) Lack of follow-up assessment of adoption of new technologies.

## Appendix II

RECOMMENDATIONS FOR SUCCEEDING REVIEWS

In preparing for the next biannual review of the BRR/IRRI project, the team makes the following suggestions:

1. The Team Leader should be appointed and provided background papers and terms of reference well in advance of the review. Team members should also be appointed well in advance and receive briefing documentation before arrival in Bangladesh.
2. The Team Leader should arrive two weeks in advance of the team. Other members should be encouraged to arrive for early consultation and visits if time and funds permit.
3. Composition of the next review team should be balanced and include a person with experience in Accounting/Management and other specific professionals as deemed appropriate. Plant Breeding, Agronomy and Economics should continue to be represented.
4. Additional time should be scheduled for meetings with:
  - a. Donors - schedule during working hours for minimum of 2-3 hours.
  - b. BRR/IRRI scientists-team should be deployed for one-to-one meetings with division heads and scientists to review programs and problems. Formal presentation should be shortened.
  - c. Management should ensure sufficient time (suggest 3 days) for completion of draft report and review with BRR/IRRI management before report is finalized.
5. Have a word processor and qualified secretary available for preparation of report.
6. BRR/IRRI should provide the team at the outset a summary briefing paper addressing the accomplishments and problems of the Institute.
7. The aerial field trip to substations should be continued.
8. One member of a previous review team should be included on succeeding teams.
9. If possible, budgetary expenditures at the Division level should be available for review.
10. Follow-up visits to BRR/IRRI or substations should be arranged if necessary.