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B A N G L A D E S H

AGRICULTURAL RESEARCH II PROJECT
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EXTERNAL EVALUATION REPORT

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LIST OF ABBREVIATIONS AND ACRONYMS

AEZ	-	Agro-ecological Zone
AID	-	United States Agency for International Development
APA	-	Associate Production Agronomist
ARI	-	Agricultural Research Institute
ARP-II	-	Agricultural Research Project Phase-II
ARP-II-S	-	ARP-II-Supplement, 1987-91
AVRDC	-	Asian Vegetable Research and Development Center
BADC	-	Bangladesh Agricultural Development Corporation
BAI	-	Bangladesh Agricultural Institute (College)
BARC	-	Bangladesh Agricultural Research Council
BARI	-	Bangladesh Agricultural Research Institute
BAU	-	Bangladesh Agricultural University
BDG	-	Bangladesh Government
BFRI	-	Bangladesh Fisheries Research Institute
BINA	-	Bangladesh Institute of Nuclear Agriculture
BJRI	-	Bangladesh Jute Research Institute
BLRI	-	Bangladesh Livestock Research Institute
BRRI	-	Bangladesh Rice Research Institute
CIDA	-	Canadian International Development Agency
CIMMYT	-	International Center for Wheat and Maize Research
CIP	-	International Potato Research Center
CSO	-	Chief Scientific Officer
CSR	-	Cropping System Research
DAE	-	Department of Agricultural Extension
DANIDA	-	Danish International Development Agency
DG	-	Director General of a Research Institute
DTC	-	District Technical Committee
DU	-	Dhaka University
DWRC	-	Denver Wildlife Research Center
FAO	-	Food and Agricultural Organization
FF	-	Ford Foundation
FRI	-	Forest Research Institute
FSR	-	Farming System Research
HYV	-	High Yielding Variety
IARC	-	International Agricultural Research Center
ICAR	-	Indian Council of Agricultural Research
ICLARM	-	International Center for Living Aquatic Resource Management
IDA	-	International Development Agency World Bank
IDRC	-	International Development Research Center
IFDC	-	International Fertilizer Development Center
IBSNET	-	International Benchmark Sites Network
IIMI	-	International Irrigation Management Institute
IPM	-	Integrated Pest Management
IPSA	-	Institute for Post-graduate Studies in Agriculture
IRRI	-	International Rice Research Institute
IRTP	-	International Rice Testing Programme
ISNAR	-	International Service for National Agricultural Research
LOP	-	Length of Project/Life of Project
LRI (BLRI)	-	(Bangladesh) Livestock Research Institute

MLT	-	Multi-location Test
MOA	-	Ministry of Agriculture
MP	-	Muriate of Potash
NARIs	-	National Agricultural Research Institutes
NARP	-	National Agricultural Research Plan
NARS	-	National Agricultural Research System
NCSC	-	National Cropping System Committee
NFRI	-	National Fisheries Research Institute
NFSC	-	National Farming System Committee
ODA	-	(United Kingdom) Overseas Development Administration
OFRD	-	On-farm Research Division
PARC	-	Pakistan Agricultural Research Council
PASA	-	Participating Agency Service Agreement
PCARRD	-	Philippines Council of Agricultural Resource Research & Development
PPP	-	Pilot Production Programme
PSO	-	Principal Scientific Officer
RARS	-	Regional Agricultural Research Station
RRA	-	Rapid Rural Appraisal
RTC	-	Regional Technical Committee
SFEI	-	Soil Fertility Evaluation and Improvement
SO	-	Scientific Officer
SRTI	-	Sugarcane Research and Training Institute
S&T/AGR	-	Science & Technology Division/Agriculture Office/AID/Wash.
T.A.	-	Technical Assistance
T.Aman	-	Transplant Aman Rice
T.Aus	-	Transplant Aus Rice
Tk.	-	Taka (Bangladeshi Currency Unit)
TSP	-	Triple Super Phosphate
T&V	-	Training and Visit System of Extension
UNDP	-	United Nations Development Programme

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SECTION 1. EXECUTIVE SUMMARY

1.1 PROJECT PURPOSE

The Agricultural Research Project II (ARP-II) was a continuation of assistance in developing a National Agricultural Research System (NARS). The first phase established basic infrastructure and advanced research in the crop disciplines. With the goal of increasing domestic food production, small farm income and rural employment, the purpose of ARP-II is to increase the effectiveness of agricultural research necessary for development and transfer of appropriate agricultural technologies to Bangladeshi farmers. Inputs and expected outcomes were focused in three areas: (1) increased capacity of the Bangladesh Agricultural Research Council (BARC) to coordinate agricultural research and to provide support services; (2) improved core discipline research to support Farming Systems Research (FSR); and (3) development of an effective FSR programme to develop and transfer useful farmer technology.

1.2 PURPOSE OF EVALUATION AND METHOD USED

This is a final evaluation to assess outputs, to determine how effectively resources were used and recommend appropriate follow-on activities. It was organized as a two-phase evaluation process including: (1) a joint team of USAID staff and local experts recommended by BARC who completed a Rapid Rural Appraisal of work at field stations and FSR sites; and (2) an external team of experts who reviewed key documents, conducted interviews at major institutions of the agricultural research system and visited selected field sites.

1.3 FINDINGS AND CONCLUSIONS

1.3.1 Coordination and Management of Support Services

The Bangladesh Agricultural Research Council (BARC) was ordinanced to coordinate and monitor the agricultural research conducted in the country. However, the ordinance did not negate the privilege of the several semi-autonomous research institutes to gain programme and budget approval directly from the Government. Toward the end of the project, BARC became effective in coordinating the drafting of a long-range, unified, agricultural research plan. This role was achieved by providing good will, useful counsel and services to the institutes. BARC also successfully managed contract research and PL-480 funds for the institutes, shifted research attention to Cropping Systems and Farming Systems Research (CSR/FSR), and sponsored an impressive number of seminars and workshops. There remains room for improvement in all services, including specifically: information management; data processing and research instrument training and maintenance; and organization of training to meet personnel needs of the NARS.

1.3.2 Improvement of Core Discipline Research

Toward the end of the project, some core disciplines were re-orienting their work to support FSR. It was the separate on-farm research units at the Bangladesh Agricultural Research Institute (BARI) and the Bangladesh Rice Research Institute (BRRI) that were primarily oriented to FSR with lmited support from core discipline scientists. In order for the core disciplines to re-orient their work for FSR, there will need to be better technical coordination with the FSR Programme from scientists located at the regional stations and headquarters.

Outputs from the crops areas (including rice) continued flowing partially from ARP-I. Outputs in plant protection were limited due to BDG delays in approving necessary facilities and work plans. Outputs from vegetable research were unsatisfactory due to lack of performance by the contractor's Specialists and their counterparts. The new soil and plant analysis laboratory had a limited impact due to insufficient operating funds and a lack of commitment on the part of the BARI Soil Chemistry Division to improve and expand services to the NARS and extension system. The contractor generated a large number of recommendations (consultants reports) on water management which were not implemented. During much of the project the Specialists were trying to create a Bangladeshi community of interest in water management issues and a programme agenda. They also assisted in developing research programs on water management at BARI and the Bangladesh Agricultural University (BAU). Considerable baseline agricultural economic studies were made after the contractor's economist trained FSR economists in basic survey and statistical methods. When the contractor left, the training stopped. Field personnel remain weak in research design and statistical analysis. There were no skills in social systems analysis developed at the FSR sites. There were no outputs in livestock research due to conflicts among the various institutes/Ministries involved.

In general, the impact of core discipline Specialist and training inputs were confined to ARI headquarters and BARC. The major exceptions were the FSR Specialists, Associate Production Agronomists, and, to some degree, the Economist, Water Management Specialists and Soil Specialist. They provided training for regional field station and CSR/FSR site scientists and field assistants. There was limited field impact by many core discipline Specialsits, because their terms of reference and counterparts were focused on work at BARC or ARI headquarters rather than regional field stations ad CSR/FSR sites. In addition, some Specialists were not inclined to work in more difficult field situations.

1.3.3 Training

Project Paper targets for foreign training were met, although with BDG delays in approval and clearance. None of the scientists who received out-of-country advanced degree training under ARP-II were assigned to regional stations or FSR work; all are located at the BARC or ARI headquarters. The contractor held an impressive number of short courses for scientists and field assistants but trained few trainers and was not

able to develop an effective BARC Training Unit. The curricula of the Bangladeshi agricultural education institutions are weak in research skills.

1.3.4 Farming Systems Research

A successful Cropping Systems Research Programme was developed resulting in some useful farmer technology. The major institutes are currently shifting their programmes toward a more complex system of Farming Systems Research. Considering the cost of FSR and field scientists' weakness in this research approach and in analytical skills, the goal of 24 FSR sites is too ambitious. There are serious difficulties in managing inter-agency teams, which are now under consideration by BARC and the senior officers of the institutes. The CSR/FSR site teams and a few regional station scientists regularly interact with peer extension personnel and farmers but the frequency and quality of this interaction is affected by funding and contractor Specialist spport. No means of systematically measuring project output, the spread of technology and benefits to farmers were established.

1.3.5 Women in Development

Other than two studies on the economic roles of rural women, the project accomplished very little in the area of increasing agricultural productivity of women. This is because USAID, BARC and the contractor failed to make this a high priority and failed to establish a programme to conduct on-farm trials with women participants.

1.4 PRINCIPAL RECOMMENDATIONS

1.4.1 Coordination and Management of Support Services

(1) That the BDG amend the ordinances of BARC and the institutes to assign BARC legal responsibility for carrying out its mandate to coordinate a national agricultural research programme.

(2) That BARC, with assistance from AID and the international centers, improve its services to the affiliated institutes.

1.4.2 Strengthening the Core Disciplines

(1) That BARC and the institutes develop means of inducing their well-trained scientists to do field service and to provide guidance to regional station and FSR site scientists.

(2) That BARI, with AID assistance, activate its pest management laboratories, begin producing useful farm technology and make new technology available to regional stations and FSR sites.

(3) That BARI and BRRI simplify their fertilizer recommendations and that the BDG prevail on the private sector to blend fertilizer to fit the major agro-ecological zones..

(4) That the new soil and plant analysis laboratory be more effectively used to support regional research and extension work on a timely basis.

(5) That horticultural research programs be expanded at regional stations and FSR sites with effective staffing and backstopping by the BARI Horticulture Division.

1.4.3 Strengthening Training

(1) That the BDG and USAID be committed to developing a strong and capable BARC Training Unit that will be able to organize effective in-country and out-of-country training programmes.

(2) That BARC and AID give priority in assigning some foreign training fellowships to high quality scientists at regional stations and FSR sites who will return to work at these field sites.

(3) That there whould be a concerted effort to provide in-service training at field stations and FSR sites by TA staff and ARI headquarters staff who have received foreign degree training.

(4) That BARC and AID assist the higher education institutions develop the capacity to adequately train agricultural and social scientists for the national agricultural research system.

1.4.4 Farming Systems Research

(1) That the institutes and BAU, with BARC assistance, adjust the FSR sites to eight with one in each major, agro-ecological zone.

(2) That BARC assist the institutes in developing effective procedures for cooperating in interagency research.

(3) That BARC/AID implement one or more instruments to measure the rate of adoption of farm technology produced through FSR.

(4) That two of the FSR sites be developed as demonstration and training sites, with the input from field experienced scientists.

1.4.5 Women in Development

(1) That BARC, BARI, BAU and AID form a critical mass of effort in FSR with a major focus of increasing the agricultural productivity of rural women.

(2) That AID provide a full-time rural sociologist to work with the above recommended effort.

1.5 LESSONS LEARNED

1.5.1 Effecting Structural Change in Institution Building

(1) The major ARP-II objectives, i.e., forming a coordinating Agricultural Research Council, improving the capacity of core discipline scientists to provide useful improved technology for farmers, creating on-farm research organizations to increase research dialogue with farmers and extension, and creating a FSR Programme, were ambitious and novel ideas in Bangladesh. Completing necessary structural changes in established institutions required more time and project assistance than was originally anticipated.

(2) In order to institutionalize a Bangladesh capacity for organizing effective in-country and foreign training to meet NARS needs, the BDG must recognize this as a priority and provide the BARC Training Unit with dynamic staff and sufficient authority and resources. If this is not done, the training is organized by TA staff on a temporary and piece-meal basis.

(3) If the best trained scientists, other research resources, ad research design/analysis responsibilities are retained at institute headquarters, there is limited progress in understanding the needs of farmers in diverse agro-economic areas and in developing useful improved technology for them. The best trained scientists should be spread out to directly address particular research problems at the regional stations and FSR sites and provide in-service training for other scientists.

1.5.2 Farming Systems Research

(1) FSR is expensive and must be employed in a manner in which the results obtained can be generalized.

(2) FSR requires strong inputs from conventional, applied research centers.

(3) The gestation period for farm technology is usually longer than the typical AID project.

(4) A long period of time was required to shift from a single crop/single disclipline research focus to an integrated Cropping Systems Research system. At least that much time will be necessary to make institutional changes to shift to a Farming Systems Research approach. Because of complex organizational problems, FSR has seldom been successfully institutionalized on a national basis.

(5) To track actual outputs and impacts of specific programs in the NARS, a Monitoring and Evaluation system has to be designed at the beginning of the project and responsibility assumed by BARC and/or a local research organization.

(6) To insure that an agricultural research project in Bangladesh focuses on agricultural productivity of rural women, USAID, BARC and BARI must agree at the beginning of the project to establish a programme to conduct on-farm trials with women participants. It should be staffed by women scientists and assisted by project Specialists.

SECTION 2. PROJECT ACHIEVEMENTS, CONSTRAINTS, AND RECOMMENDATIONS

2.1 BARC'S COORDINATION AND SUPPORT OF THE NATIONAL AGRICULTURAL RESEARCH SYSTEM

2.1.1 Findings: Achievements and Constraints

(1) BARC has gained the cooperation of the agricultural research institutes in drafting a national research plan to the year 2000. The plan is near completion. BARC will present the plan to the BDG Planning Commission.

BARC will require outside assistance in implementing and monitoring the plan.

(2) BARC's effort was essential for the organization of the National Cropping Systems Research Programme and the current National Farming Systems Research Programme. BARC organized training and provided overall coordination.

However, because of current excessive responsibilities, BARC should assign responsibilities for coordinating site planning to the BARI On-Farm Research Division which is more experienced in CSR/FSR programme planning.

(3) In the last two years of the project, BARC has informally acquired the role of coordinator of research through good will and providing useful resources (services, contract research and PL-480 funds and Specialists) to the research institutions.

BARC was mandated to coordinate, monitor and evaluate all research conducted in agriculture, forestry, fisheries and livestock in Bangladesh. Its ordinance is flawed, in that each of the commodity research institutes is ordinanced as a semi-autonomous entity over which BARC has no review authority.

(4) The scientific capability of BARC staff is not being maintained because there is no way for staff to return to gain and/or maintain active research experience.

(5) During the life of the project, the donors have greatly expanded BARC's duties and responsibilities. In response, BARC has increased its total staff to 350, making the scientific staff top heavy.

(6) BARC solicits and evaluates project proposals, provides financial management, monitors progress and evaluates a large pool of contract research funds provided by AID and other donors. These funds allow BARC to fill gaps in the ARI's core funded programmes.

The workload associated with managing these funds has taken BARC staff away from their primary duties.

(7) BARC, through expatriate assistance, developed a complete personnel data base, showing the inventory and requirements of human resources for the national agricultural research system over time.

However, BARC's Training Unit does not have adequate authority, skills, and resources to design and organize training to meet personnel needs. The NARS has not yet given priority to training nor provided dynamic staff and resources for this purpose.

(8) By the end of the project, BARC had achieved effective communication with the institutes, particularly concerning the national plan.

BARC's assistance to the institutes in scientific information and in electronic data processing was inadequate.

(9) The contractor effectively assisted BARC and BARI in managing their equipment maintenance services.

The contractor's advisor was handicapped by the fact that (a) his task was too broad to be mastered by one person, and (b) he was not assigned a counterpart. BARC and the contractor provided less than satisfactory assistance in the procurement, installation and use of commodities, other than farm machinery and the soil analysis laboratory at one institute.

2.1.2 Recommendations

(1) That AID and the International Service for National Agricultural Research (ISNAR) provide BARC long-term technical assistance to aid BARC in implementing the National Agricultural Research Plan and a monitoring system.

(2) That BARC/ISNAR design and implement an in-service training programme in research planning, monitoring and evaluation for the benefit of the affiliated institutes and BARC.

(3) That the coordination for the FSR Technical Advisory Committee should be the responsibility of the Head of the BARI On-Farm Research Division because of this Division's extensive CSR/FSR programme experience.

(4) That the BDG amend the ordinances of BARC and the cooperating institutes to provide legal authority for BARC to carry out its mandate.

(5) That as a means of facilitating coordination among the institutes, the office of Vice-Chairman of BARC be ordinanced at the Secretariat level in the Ministry of Agriculture.

(6) That a uniform personnel system be adopted and that the ordinances of BARC and the ARIs be uniformly amended to allow staff transfer among BARC and the ARIs.

(7) That BARC pass on to the ARIs the work logically better handled by the principal investigators, that BARC reduce the number of divisions, and that staff strength be held at the present level.

(8) That contract research management procedures be simplified and much of the management of the contract research projects be assumed by the ARIs.

(9) That through contract services, AID assist BARC and the institutes in completing and implementing a combined long-term personnel development plan.

(10) That the Minister of Agriculture and the Minister of Fisheries and Livestock delegate full authority to BARC to coordinate research personnel policies, including training.

(11) That the BDG provide resources and dynamic staff for building an effective BARC Training Unit.

(12) That BARC complete the drafting and clearance of the long-term National Agricultural Research Plan (NARP).

(13) That BARC, AID (contractor, ARP-II-S) and the ARIs draft life-of-project plans and annual work plans consistent with the long-term NARP.

(14) That AID underwrite the subscription and purchase of the books and journals required by the scientists at the institutes and in the field.

(15) That BARC/AID develop the capability to publish the institutes' research reports.

(16) That BARC decentralize use of some computer equipment and, with AID assistance, provide maintenance service and adequate training in data management to institutes and regional stations so field scientists can do their own data analysis.

(17) That AID/BARC analyze the tasks required for assistance in procurement, facilities management and maintenance and provide the appropriate skills under the project supplement.

(18) That BARC, with AID contract assistance, staff its maintenance service cell and develop an effective system for equipment use and maintenance at all research stations.

2.2 ASSESSMENT OF OUTPUTS IN THE CORE DISCIPLINES

2.2.1 Findings: Achievements and Constraints

(1) Skills in economics and social science at the regional station and FSR site level were non-existent at project startup. Limited skills in economic analysis were developed by the contractor. No field-level skills in social systems analysis were evident.

(2) Senior crop and discipline scientists at headquarters are not adequately supporting the regional station scientists and FSR teams, nor are they actively seeking out farmer inputs at the field level.

(3) Little or no progress was made in vegetable research.

(4) The rice research programme is on track.

(5) The present system of using soil analysis to make fertilizer recommendations is ineffective in assisting farmers to make optimal use of fertilizer.

(6) Regional station and FSR scientists are not using soil and plant analysis data in their interpretations of trials results because they do not receive timely results from the BARI Soil and Plan Analysis Laboratory.

(7) A significant amount of in-country training was organized by the contractor's water management Specialists, and new water management research programmes were established at BARI and teh BAU.

(8) Primarily through short-term consultants, the contractor made 135 major recommendations for the newly established water management sector, none of which have been implemented.

(9) The work in vertebrate pest management is on track.

Very few objectives in the areas of non-vertebrate pest management were met, primarily because of BDG delays in approving necessary facilities and work plans.

(10) The contribution to agriculture by nuclear radiation in Bangladesh and world wide has been very limited.

(11) The Bangladesh Livestock Research Institute (BLRI) became organized to work just as the project ended. It has an appropriate work plan and it has begun FSR.

BLRI has encountered communication problems with BARC and other ARIs in implementing interagency FSR activities.

(12) The National Fisheries Research Institute (NRFI) was ordinanced near the end of the project. With FAO assistance, it is developing promising improvements in component technology.

(13) The project provided for an impressive amount of foreign training, and Project Paper (PP) targets were met. However, there were delays in approval and clearance.

(14) An impressive number of in-country, short courses and workshops were held, primarily organized by the contractor's Specialists.

(15) The curricula of the Bangladeshi agricultural education institutions are weak in research skills and in practical skills.

(16) The institutes retain almost all foreign-trained scientists at headquarters. They are seldom used in in-service training at regional stations and FSR sites.

(17) Bangladesh has had long and fruitful relations with three international centers, supporting research on rice, wheat and potatoes.

(18) Food grain production increased at the annual rate of about two percent from the early '70s until 1985, but at a lower rate since (the reason for the decline is not known). The increase is credited to research, extension, water management and fertilizer -- each a critical input. ARP-II could not have made a significant payoff to date because the gestation period for technology development is longer than the life of the project. The spread of technology introduced by the project was observed but not systematically measured. No clear assignment of responsibilities for measuring adoption rates and impacts were made to BARC, the institutes, or an outside research organization.

(19) Although two studies on the economic role of rural women were carried out, there were no research trials targetted toward increasing women's agricultural productivity. There was no specific research unit or Specialist tasked with this objective.

(20) The contractor's Specialists provided outstanding service in production agronomy and information, less than satisfactory service in horticulture and administration and satisfactory service in the other areas.

2.2.2 Recommendations

(1) That BARC and AID contract with BAU and other institutions to provide pre-service and in-service training in economic and social systems analysis for field-level, FSR scientists.

(2) That AID provide the necessary technical assistance to facilitate the development of field-level socio-economic skills of FSR site scientists.

(3) That BARI encourage commidity and discipline scientists at headquarters and at regional stations to work with FSR staff to improve FSR on-farm trial planning and analysis.

(4) That AID provide adequate transportation for principal scientific officers at headquarters to carry out working visits to regional stations and FSR sites.

(5) That AID provide able and qualified technical assistance in vegetable research.

(6) That BRRI and IRRI continue the present rice research programme.

(7) That BARI require that all fertilizer response trials include soil analysis.

(8) That BARI expand the usefulness of the new Soil and Plant Analysis Laboratory by improving the system of intake of samples and providing timely results to research scientists and extension staff in all regions.

(9) That BRRI and BARI make a single fertilizer recommendation for each major crop in each major agro-ecological zone.

(10) That the BDG encourage the private sector to formulate complete fertilizers mixed in the recommended proportions.

(11) That BARC distribute the water management consultant reports and take appropriate actions to implement priority recommendations.

(12) That AID provide BARC technical assistance as needed to carry out the above recommendation.

(13) That BARI and the Denver Wildlife Research Center (DWRC) continue the present programme of vertebrate pest management.

(14) That BARI/AID (contractor) install the toxicology lab equipment, finish publication of the pest management manual and distribute it quickly with necessary training to regional station scientists and extension officers.

(15) That the Ministry of Agriculture (MOA) and the Bangladesh Institute of Nuclear Agriculture (BINA) direct the considerable resources of the latter to complement the work of other research institutes.

(16) That BARC assist in improving interagency FSR research cooperation and management.

(17) That AID provide technical assistance to BLRI in developing field competence in FSR activities.

(18) That the International Center for Living Aquatic Resource Management (ICLARM) assist the National Fisheries Research Institute (NFRI) in supporting FSR.

(19) That BARC coordinate a plan to bring the technical skills of the affiliated institutes up to the level needed to implement the National Agricultural Research Plan (NARP).

(20) That BARC/AID (contractor) assist the institutes in drafting and implementing a life-of-project, in-country training programme.

(21) That AID give special attention to assisting BAU improve its undergraduate, graduate level and special, non-credit teaching and research capabilities.

(22) That the institutes implement a personnel support system that would make duty at rural research sites attractive to scientists.

(23) That BARC and AID give priority in assigning some foreign training fellowships to high quality scientists at regional stations and FSR sites who will return to work at these field sites.

(24) That the institutes develop in-service training programmes wherein the foreign trained scientists share their skills with other scientists, particularly at regional stations and FSR sites.

(25) That BRRI and BARI continue their present linkages with the centers.

(26) That BARC link with ISNAR for assistance in research administration, planning and evaluation; that BARI link with the Asian Vegetable Research and Development Center (AVRDC) for vegetable research; that NFRI link with ICLARM for fisheries research.

(27) That BARC/AID design and implement a programme to measure the effectiveness of the project in increasing household/ farm income and national agricultural production.

(28) That BARC and BARI, with technical assistance funded by ARP-II-S, develop a model component of the FSR programme with emphasis on trials to increase the agricultural productivity of rural women.

(29) That AID analyze the jobs of chief of the contractor's party and senior research management specialist for compatibility and workload to determine whether one person can perform both.

(30) That BARC, BLRI and NFRI provide qualified counterparts to AID-financed Specialists.

(31) That BARC and AID try to reduce the number of consultants retained for brief periods and carefully plan the use of all short-term consultants.

(32) That BARC and AID define terms of reference for Specialists to maximize assistance provided to regional station and FSR site scientists.

2.3. ASSESSMENT OF THE FARMING SYSTEMS RESEARCH PROGRAMME

2.3.1 Findings: Achievements and Constraints

(1) During the project there was a systematic collection of information about local farm production conditions and household economic systems at FSR sites by the CSR/FSR scientists. This information has been used to develop improved cropping system and cultivation practices to be tested in on-farm trials.

However, this information base is not as useful as it could be because it is available in scattered reports and often not pulled together as a working fund of knowledge by frequently transferred researchers.

(2) By the end of the project, there was a demonstrated capacity to conduct relevant Cropping Systems Research at about 11 CSR/FSR sites.

Only two BARI sites and the BAU sites were adding other FSR components during the last year of the project. Both the research institutions and some major donors support FSR. This FSR experiment will be the largest in the world.

(3) New crop varieties were introduced and new cropping patterns and improved cultivation methods were developed through CRS which continued through the end of the project.

Limited technology has flowed from FSR because FSR trials were only initiated during the last year of the project at a few sites.

(4) Although spread of new technology was observed in some cases, there was no monitoring system established to measure adoption rates or benefits to farmers or improved technologies.

(5) A National Farming Systems Research Committee was established in 1985, but the institutes had just begun interagency cooperation as the project ended. So far, they have not adopted effective procedures for implementing joint research projects. The Executive Vice Chairman of BARC is aware of the problem and has efforts meetings to work out procedures.

(6) Because of traditional organization of research and turf problems, it has been difficult to pull together interdisciplinary working teams within a single research institute such as BARI to support CSR/FSR. There has been little input by horticulture, entomology, plant pathology, soils, and water management in the on-farm trials. However, toward theend of the project, BARI headquarters borrowed the idea of interdisciplinary task forces started at BRRI. Also, project Associate Production Agronomists encouraged interdisciplinary discussions at regional stations.

(7) The FSR Programme is overextended without adequate trained staff, TA, and other resources to effectively operationalize the planned 24 FSR sites.

(8) There has been training of FSR site teams and evidence of improvement in research skills, particularly at BAU and where project Associate Production Agronomists were located at regional stations and worked with scientists over a lengthy period.

Generally, however, skills in planning relevant research, useful analysis of data, and report preparation are weak.

(9) A major CSR/FSR training effort for scientists and field assistants was carried out by BARI's On-Farm Research Division with strong input from the contractor's Specialists. Good training materials on CSR/FSR methods are available at BARI and BAU.

(10) Research and extension are cooperating in regularly scheduled district and regional meetings and farmer field days. BARI and BRRI on-farm research divisions are playing a key role in these contacts with extension and farmers.

Most of the burden of managing on-farm research and dissemination of new technologies lies with research because it has more donor-supplied resources and more motivated staff. However, the number of farmers who can be reached directly by the research system is limited.

(11) The project Associate Production Agronomists located at selected regional stations effectively encouraged research linkages with extension and farmers and used their vehicles and other resources to aid such interactions. They organized useful joint review and planning sessions for the CSR/FSR research trials.

(12) There was limited economic analysis of on-farm trials and no on-farm research trials at FSR sites targetted to women participants.

(13) Analysis of soil samples in on-farm trials was not very evident either because of poor research methods and/or the failure of the new soil and plant analysis laboratory at BARI to get analytic results back to field scientists in a timely way or often at all.

(14) The on-farm trial input levels (e.g., fertilizer rates) seemed high for a small farmer subject to risk.

2.3.2 Recommendations

(1) That BARC and AID implement a system of monitoring FSR to measure its effectiveness in proving and disseminating useful farm technology.

(2) That BARC with the assistance of the project Specialist team aid the institutes in developing effective procedures for cooperating in interdisciplinary and interagency research for the FSR programme.

(3) That the institutes reduce the number of FSR sites and concentrate efforts on developing technology for major agro-ecological zones that can be reliably generalized.

(4) That BARC, AID and the institutes develop two FSR demonstration sites for pre-service and in-service training programmes.

(5) That BARC, BARI, BAU and the project contractor form a critical mass of effort in FSR with a major focus of increasing agricultural productivity of rural women by conducting on-farm trials with women participants.

(6) That simple fertilizer rate studies be conducted in farmers fields to determine low input recommendations.

(7) That all FSR trials include detailed climate, soil, and crop development data and input/output variables for better interpretation of trials results.

(8) That the regional review and planning sessions for the FSR programme be continued with contractor Specialists facilitating the dialogue between regional research and extension officers.

SECTION 3. THE EVALUATION

3.1 ASSESSMENT OF BARC'S COORDINATION AND SUPPORT OF THE NATIONAL AGRICULTURAL RESEARCH SYSTEM

3.1.1 Major Findings

The National Agricultural Research System in Bangladesh is fragmented through numerous Ministries and commodity/discipline oriented institutes. Without coordination, the research from the system could not produce integrated packages of technology for local farming conditions.

The agricultural research systems of Asia usually have a council or other body which coordinates research. The Asian systems have been considered much more successful than those in other regions in their ability to mobilize research toward solving country-specific, agricultural problems. In particular, these councils have helped to prioritize research and to coordinate research within the country-wide research system. The councils resolve inequities in funding by allocating scare resources to problem-solving sites. The councils have established systems for evaluating research to determine whether it will lead to the development of problem-solving technology. When first established, they all suffered from lack of cooperation from the agricultural research institutes they were to coordinate. However, most overcame this problem by being given increasing authority to carry out their mandate, which includes:

a) the council chairman holding the position of Secretary of Agriculture for Research;

b) ARI ordinances amended to clearly delineate the council's role;

c) a procedure to keep the council scientists current and to allow them to do research periodically;

d) authority to the council to evaluate and approve all research, including annual plans and budget submissions.

BARC was established in 1973 with responsibility for:

a) preparing a national agricultural research plan, prioritizing the research, and allocating scarce resources among the institutes;

b) coordinating the research programmes of the various institutes and evaluating and monitoring research projects;

c) preparing a personnel development plan for the National Agricultural Research System (NARS).

The need for a coordinating council has increased as the ministries have fragmented and the number of institutes has grown.

During the life of the project BARC has been assigned additional duties and responsibilities, at the urging of donors and consultants. These include support service duties, as well as management of contract research and PL-480 funded research. In response, BARC has grown to 358 total staff and increased its member/directors from five to nine.

3.1.1.1 Impact of ARP II on the NARS (A Summary)

(a) The most significant achievement during the life of the project was the increasing acceptance by the institutes of BARC as the coordinator of research. The institutes now invite the BARC to attend annual planning meetings and request assistance in the development of institute master plans. This indicates that BARC is perceived as useful in these exercises. BARC prepared the guidelines for the master plans and has presented seminars in programme planning at each institute.

(b) The Council is using institute master plans, consultants, and FSR research results in revising a National Agricultural Research Plan (NARP).

(c) BARC, supported by ARP-II, has been highly successful in shifting institute research orientation toward cropping systems research and farming systems research. The established institutes have begun multidisciplinary, FSR programmes, and the Livestock Institute and Fisheries Institute are following suit. Now, for the first time, teams of scientists are able to take a holistic, systems approach to solving small farm problems.

(d) The Council has just created a computerized data base of all personnel in the national agricultural research system, and published a Manpower Planning and Development Guide. The data base contains lists by institute, grade, age, academic degrees, and retirement date, of all staff, and a tentative training schedule. This data base will enable BARC to match the human resources in the system with the research programmes in the National Agricultural Research Plan and from this a schedule of training needs to implement the plan.

(e) BARC financed, initiated, and participated in an impressive number of seminars, workshops, in-service training, and long term degree training. All of these seminars and training activities were funded by ARP II.

(f) BARC has managed an increasing amount of contract research. However BARC scientists and project consultants have remarked about the increased work load, not only of evaluating and monitoring contract research proposals but also helping scientists in the field prepare proposals.

There is a feeling among many BDG officials and AID staff that the ARP-II and the ARP-II Supplement are mainly strengthening grants

to BARC. This is incorrect. The institutes received 79 percent of the funds in ARP-II, and they will get 85 percent of the funds provided by the Supplement. In both projects, the only significant expenditure for BARC is for consultants, and they spend a great amount of their time helping the institutes.

Percent of Funds in ARP-II-Supplement
For The Strengthening of BARC and the ARIs

	BARC	ARIs
Technical Assistance	45%	55%
Training	10%	90%
Commodities	1%	99%
Reproduction (as a service Publishing to ARIs)	100%	0%
Contract Research	10%	90%
BRRI	0%	100%
DWRC	0%	100%
Percent of Total Project Funds	15%	85%

Percent of ARP-II funds expended on BARC and on ARIs

Item	Allocation BARC	Allocation ARIs
1. TA: Long Term	40	60
Short Term	5	95
2. Training	10	90
3. Contract research	0	100
4. Commodities	5	95
Percent of Total Funds	21%	79%

3.1.1.2 Constraints and Recommendations

3.1.1.2.1 Authority of BARC

BARC is mandated to coordinate, monitor and evaluate all research conducted in agriculture, forestry, fisheries and livestock. The system is flawed, in that each of the commodity research institutes is ordinanced as a semi-autonomous entity over which BARC has little authority. To be more effective, BARC must have the authority to enforce unpopular actions to effect compliance with evaluations and the National Agricultural Research Plan. India and Pakistan helped solve this problem by creating the position of Secretary of Agriculture for Research in the MOA and making the Vice Chairman of the Council concurrently the Secretary. We recommend that MOA name the Executive Vice Chairman of BARC concurrently Secretary of Agriculture for Research. We also recommend that the ordinances of all agricultural research institutes be amended to clearly reflect the duties, responsibilities and linkages between BARC and the institutes.

BARC is now involved in preparing and approving both the five year plans and the annual plans of the ARIs. However, the ARIs forward their annual budget submissions with their research plans directly to their ministries for review and transmittal to the Planning Commission and Finance Ministry. There is no check by BARC or any other body to compare the budget plan with approved annual plan. We recommnd that BARC should have the authority approve the research plan in each ARIs annual budget submission to verify that it conforms to the institutes annual plan and the national plan.

3.1.1.2.2 BARC's personnel capability

The credibility and strength of BARC can only be maintained by providing a means for its scientific staff to be the best in their respective disciplines, up-to-date with current technology. They should be able to return to research periodically. In order to rotate back to an ARI, there must be a uniform personnel system among the ARI's and BARC. We recommend that the ordinances of all institutes be amended to provide uniform personnel system to facilitate the transfer of personnel.

3.1.1.2.3 BARC's role and performance in allocating research resources provided by donors

Contract research is attractive for donors because it can address agricultural problems with a balance of personnel and operating funds. This has been a severe constraint in the core funded projects. The contract research programme has had problems, mainly with disruption of money flows because of the AID, 60-day advance system. The BARC contract research manual has solved many problems caused by misunderstanding of procedures. However, BARC is concerned because of the magnitude of funding by donors ($10 million) to be managed. This requires a disproportionate amount of staff time at the expense of other duties.

We recommend that AID and other donors collaborate with BARC in devising a simplified contract research management system acceptable to all donors. The 1985 External Evaluation proposed a simplified procedure.

BARC has been very effective in distributing PL-480 funds.

3.1.1.2.4 Organizational growth of BARC

As more duties and responsibilities have been given to BARC, its total staff has increased and five new Member-Director positions were created to a total of nine. Member-Directors are ranked with ARI Directors, even though a Member-Director may supervise only 10 or 12 scientists. We recommend that BARC pass on to the ARIs the work which can more logically be handled by their principal investigators, that procedures be simplified to reduce work loads, and that BARC restructure itself to fewer Member-Director divisions. The total staff should be held at the present level.

3.1.1.2.5 Training approval

BARC has prepared a personnel data base on strength in the ARIs. It will prepare a training plan based on the personnel needed to implement the national agricultural research plan. BARC will not be able to assure that ARIs comply with their training schedule unless they approve all overseas and long term degree training. ARI directors have recently been given authority to approve short term training overseas and a problem will arise if BARC is not informed. We recommend that all long term and overseas training be approved by BARC.

3.1.1.2.6 General appraisal of BARC's performance

Do the benefits of BARC to the national agricultural research system justify the expense, or would direct assistance to research institutes have been more cost effective? This question has been asked in every country that has an organization whose mandate is to coordinate a large, diverse research system. The answer in India, Pakistan, Philippines and Indonesia has been, Yes. In countries where most research funds are passed through one ministry, that ministry can perform the function. Four BDG Ministries conduct agricultural research.

The need for coordination has been recognized by GOB officials, the ARIs, AID, other donors, and all agricultural research management specialists the evaluation team knows. The question is, has BARC done a reasonable job of coordinating and will it continue to improve? We have stated above that BARC has shown progress in programme planning, personnel planning, national research planning and communication. We have recommended many actions that we feel the government must take to give BARC the authority to enforce compliance with the various aspects of its mandate and to improve its staff capability. Should the BDG not implement the recommendations in the next two years, AID should reappraise its options in funding agricultural research in Bangladesh.

3.1.2 BARC's Role in Planning Development Goals, Policies and Research Programmes

3.1.2.1 National Agricultural Research Plan (NARP)

BARC has almost finished a revision of the NARP for the period, 1988-2000. BARC has had a surprising amount of cooperation from the institutes and other organizations comprising the National Agricultural Research System (NARS) in this endeavor, in spite of a lack of legal authority to carry out its mandate. It is not known whether this cooperation is due to compatible relationship between BARC and institute director generals, in which case the cooperation could be temporary, or whether the institutes believe there is a need for an apexical council to coordinate research nationally. In any case, the acceptance of BARC by the NARS has improved noticeably during the life of the project. Notwithstanding the cooperation, there is an essential need to address the problem of authority. (See 3.1.3, below).

Cooperation began to improve after consultation by the contractor's consultant, Guy Baird, in 1985. He and members of the Planning and Evaluation Division of BARC visited all the institutes and discussed programme objectives in terms of anticipated results and relating budget and staffing to priority research programmes. A revised master plan guide has been developed and is being used by the NARS.

The process for drafting and revising institute master plans and annual plans and from these, the NARP, is working smoothly. The institutes put together their plans on a commodity/discipline basis. Planning meetings are held with BARC staff participation in a supportive role. BARC is formally invited when the institutes hold their annual review meetings. In this manner BARC is involved in the approval process. The institute plans then are forwarded to the Planning Commission for BDG approval.

In preparing the NARP, BARC selects a committee of its own staff, outside consultants and other appropriate BDG officials. Using institute master plans they begin drafting an agricultural priority plan, taking into account the: (a) agro-economic problems of farmers; (b) national development goals and policies; and (c) special interest groups, including donors interest and institutes.

3.1.2.2 Programme planning for FSR sites

R.N. Mallik, until recently associate Production Agronomist at the FSR site at Jshurdi, has a World Bank/BARC contract for 12 months to do programme planning for FSR sites. He is officed with the BARC Member-Director for planning and evaluation.

BARC plays a role in the coordination of FSR. BARC chairs the FSR National Technical Coordination Committee. BARC may wish to transfer the chairmanship of this committee to BARI, the institute most active in FSR. BARC could then concentrate on a support services role. The following recommendations are offered to insure improved coordination:

(a) The committee should meet on a regular basis;

(b) It should specify need and venue for FSR training;

(c) It should evaluate the role of FSR in the transfer of technology and report these findings to the MOA and other interested bodies.

3.1.2.3 Monitoring and evaluation

Monitoring and evalution responsibilities lie primarily with the member-directors for commodity groups or non-commodity problem areas. The Planning and Evaluation Division is intended as a support service for the commodity member directors. BARC cannot be expected to closely monitor each research project. This is the responsibility of the institute with participation by BARC in such areas as annual reviews, programming, workshops and in support services. BARC should be involved in all research evaluation but coordination of commodity task forces should reside with the institutes.

3.1.2.4 Recommendations

(a) That training in programme planning be scheduled for BARC staff including the Planning and Evaluation Division personnel and selected scientists in the commodity divisions. Workshops should then be held for ARI staff.

(b) That a long term consultant from ISNAR be officed in the Planning and Evaluation Division to assist BARC and the institutes in their planning and reporting duties. In-service training should be an ongoing responsibility.

(c) That a computer data base of ongoing and planned research or a classification matrix of research linked to manpower and budget be developed and monitored.

(d) That a committee be formed, with BARC chairing, to evaluate annual plans and approve/disapprove/revise plans on technical as well as duplicity grounds.

3.1.3 Structural Constraints

3.1.3.1 Relations between BARC and the NARS

There are nine major ARIs plus BARC in the NARS of Bangladesh. Each was created by unique ordinance which defined its role and relationship to its affiliated ministry. The BARC ordinance directed it to coordinate, evaluate and monitor all agricultural research in the country. The problem was that ordinances of the institutes were not amended to accommodate the BARC mandate. Another problem is that without a uniform personnel policy (pay, retirement, recruitment, promotion and benefits) there cannot be an exchange of scientists among institutes.

We recommend that BARC, with the help of technical assistance (TA) provided by ARP-II-S, carry out a study of the personnel system in the NARS. A personnel policy committee, with representation from the Public Service Commission, the Ministry of Establishment and BARC, would review the present promotion system, based on seniority, for assignments and promotions, and develop an equitable system based on merit and productivity as determined by peer review.

We recommend that the committee devise a procedure whereby scientists may be rotated among BARC, the ARIs and the universities. This would allow new ideas and technologies to be introduced to various organizations, and it would foster close ties among the isolated entities of the NARS.

Councils in neighboring countries are well aware of the need to rotate staff. In Pakistan, for example, most of the Pakistani Agricultural Research Council (PARC) staff are seconded from the province ministries of agriculture.

BARC scientists should schedule their time to allow more visits to ARIs to attend workshops, to confer with scientists concerning constraints, and to visit field research sites, not in a official monitoring role but as observers. (Monitoring should be done by the principal investigators of the institute.)

3.1.3.2 Status of the office of Executive Vice-Chairman of BARC

When first introduced, agricultural research councils are always resented for they are given review and approval authority over other entities of the NARS. They evaluate performance and control funds. If they are effective, they must enforce very unpopular actions to reduce duplication.

India and Pakistan solved the problem by amending the charter of the council, making the Vice Chairman of the Council concurrently the Secretary of Agriculture in Research in the Ministry of Agriculture. This action legally linked the Council with the MOA, hence with all the institutes within the MOA. The Council could then execute its mandate without awaiting invitations.

In the case of Bangladesh, the institutes cooperate with BARC because it has something to offer, i.e., contract research funds and PL-480 funds, because they realize there is a need to coordinate research, and because the major donors are very keen on the concept of BARC. At the same time, it appears that BARC is reluctant to make decisions critical of the institutes' programmes for fear of not being invited back. BARC should have the authority not only to evaluate but also to disapprove projects.

We recommend that the Executive Vice Chairman of BARC hold the position of Secretary of Agriculture for Research.

3.1.3.3 Internal structure

BARC, as of September 1987, had 358 total staff, with 73 scientist positions approved and 50 filled. The educational composition of the filled positions is 18 Ph.Ds., 28 M.Scs. and three B.Scs. All nine member-director positions are filled. The number of member-directors has increased from four since 1973. The reason for adding member-directors, hence divisions, was to bestow status to the proliferating commodity and disciplinary divisions. (The civil service rank of member-directors is the same as that of the directors of the institute.) This was deemed necessary because BARC did not and does not have the needed authority to effectively coordinate research.

3.1.3.4 Contract research

Currently, seven donors (IDA, AID, FAO, CIDA, IFDC, IDRC, and the BDG) are providing funds directly to BARC to coordinate and manage a diverse array of research projects. BARC solicits research proposals, evaluates them, provides funds on a 60 day advancement basis, monitors progress and evaluates results. The donors are satisfied with the system and have increased their contributions accordingly. Contract research afforded the donors entree to the NARS, providing them funds to fill gaps in the core-funded programmes.

As the contract research programme grew, so did the work load for BARC scientists who manage and monitor the projects. This is usually the responsibility of the institutes, which have large staffs. Consequently, BARC scientists have had to cut back on their planning roles and have earned the title of "clerk" by institute scientists.

In consideration of the above situation, AID has drastically reduced funds for contract research in ARP-II-S. We agree with this decision. Unfortunately, the other donors have not followed suit.

We recommend that BARC retain responsibility for evaluating contract proposals and outputs, and that the institutes manage the projects.

It is time for BARC's role and responsibility in relationship to the whole NARS be reassessed. A committee or task force comprised of high ranking BDG officials should consider the following actions:

a) Transfer as much of the management and day-to-day monitoring of contract research to the institutes. Transfer the chairmanship of commodity task forces to the appropriate institutes.

b) Amend both BARC and ARI roles and responsibilities giving BARC authority to enforce compliance of the NARS with the NARP and BARC's evaluation of annual research plans.

c) When a) and b), above, are accomplished, BARC can reduce the number of commodity/discipline member-directors and incorporate those services in the plant science and animal science divisions, thus enhancing a multidisciplinary approach to planning and monitoring.

3.1.4 BARC'S Role In Developing the National Agricultural Research Personnel Plan

3.1.4.1 Personnel policies and procedures

BARC is responsible for human resource development for agricultural research. To do this BARC has a training division which has the responsibility to determine the needs and then develop or train the human resources required to effectively execute the national agricultural research plan.

A specialist assigned to the BARC training office earlier developed plans and requirements for the office. Another specialist assisted in preparing guidelines and procedures for selecting trainees. The most recent one assisted in the preparation of data base, Manpower Planning and Development Summary for Agricultural Research. This is a compilation of agricultural scientists nationally, by institute discipline, gender, age, education, and estimated year of retirement. This information was concisely prepared in easy to read text, tables and graphs, and is computerized. It should provide the basis to match training needs with future national research requirements. Each research institute also recommended persons for training in specific disciplines. The next challenge to BARC will be to assess these recommendations against the national plan and available funds. Another training specialist will be needed to assist in this task.

A constraint often noted was the difficulty and length of time for trainees to receive approval for foreign travel and training. Recently this authority was granted to director generals of the research institutes for senior scientific officers, receiving up to 4500 Tk per month. Although this is progress, we wonder if BARC now only has the responsibility and funds, but not the authority to approve or disapprove foreign training.

In general, we believe BARC is carrying out its training mandate. The training goals of the project were met, and this will be the longest lasting benefit to improving agricultural research capabilities of any funds spent for ARP-II.

3.1.4.2 BARC's role in training

At annual meetings, the requests for training by the institutes are discussed and agreed upon in the light of national needs. After agreements are reached the directors of the institutes may approve candidates for foreign travel or training, but should keep BARC informed.

For in-country training, BARC's role should be simply planning, monitoring and evaluation. The teaching should be done by the appropriate institutions. BARC should maintain an advisory role.

BARC should prepare annual lists of training courses, workshops,

conferences, in-country and circular announcements of training opportunities at international agricultural research centers and institutions of higher learning.

3.1.5 BARC's Role In Communicating Agricultural Research and Planning Information to the Institutes

3.1.5.1 Communicating planning information to managers

3.1.5.1.2 Background

Prior to ARP-II, BARC, with heavy input by consultants, drafted a national agricultural research plan for the period, 1980-1985. The document was not accepted by the affiliated institutes as a guide for their activities. In 1985, a team formed by the BARC Planning and Evaluation Division and aided by the contractor's consultant, Guy Baird, led workshops at the institutes and regional stations on goal-oriented research planning.

Subsequently, the BARC Executive Vice Chairman invited the Director Generals of the institutes to participate in drafting a unified, national agricultural research plan for the years, 1988-2000. The institute directors agreed to draft their respective plans and send them to BARC to be incorporated in the national plan. BARC would incorporate the institute's plans in its draft of the national document and send it to institutes for comment. BARC would incorporate the comments in a final draft and send it to the appropriate ministries and the Planning Commission.

BARC has received copies of all of the institutes' draft plans, and has almost completed the first draft of the national plan.

We gathered enough information to know the intended process and how it worked, at least in some places. Our rapid rural appraisal revealed that FSR site scientists asked farmers about production bottlenecks and about the acceptability of certain varieties and technology. They invited extension officers to help them review the year's work just ended and plan the next year. The FSR site workers and the extension subject matter specialists participated in the regional research station reviews (Annex C). The regional scientists participated in multi-day "task forces" at the institute headquarters, which reviewed the reports and proposals that came up the channels from the field. The "task forces", corresponding to institute divisions, presented their findings and their programme proposals to the director general and a ministry-wide ensemble of peers for review and approval. The combined product was the institutes' draft plan.

BARC's senior officers were invited to participate in the "task forces" and the programme reviews. Some, but not all of the officers participated at some, but not all of the exercises to which they were invited.

3.1.5.1.2 Appropriateness of the procedure

This account reveals the intent of bottom-up planning, beginning with farmers, who attended FSR field days in large numbers. This is appropriate.

3.1.5.1.3 Outputs

(1) A valid method of planning research for the benefit of farmers was introduced and accepted.

(2) The institutes and BARC established informal procedures for working together.

(3) A draft, long-term, national agricultural research plan is near completion.

3.1.5.1.4 General appraisal

Obviously, BARC communicated planning information to research managers. Senior officers of the institutes told us they appreciated the help in planning. One told us that he was disappointed that his institute did not get more participation by BARC. This reflects that BARC's help in planning is valued by the institutes.

3.1.5.1.5 Recommendations

(1) Continued assistance: Systems planning is a new concept in the Bangladesh agricultural research community. BARC, with ISNAR assistance, preferably, should assist a training institution in offering hands-on courses in research planning and evaluation. BARC's Member-Directors should assist the institutes with their programme "task forces" and reviews.

(2) Monitoring: BARC, with AID and ISNAR assistance, should implement a monitoring system that would reveal the extent to which the plan is implemented.

3.1.5.2 Communicating technical information to scientists

3.1.5.2.1 Libraries

Our judgement on the adequacy of the scientific libraries is based on cursory observations at BARC, BARI, BRRI, BINA and BLRI. We learned that a new library for BFRI, planned by FAO, is underwritten by IDA. Books purchased through the ARP-II project to start the BLRI library have just begun to arrive.

The Bangladesh Institute of Nuclear Agriculture (BINA) and

BRRI libraries appear to be adequately stocked with books and journals through 1986.

We found the BARI library well documented, well-managed and in use. However, it's stock is inadequate for current reference needs of BARI scientists. There were very few journals of world status and few, if any, later than 1985. We heard many complaints of journals lost in the mail. BRRI overcomes this by subscribing to a private distribution service in Singapore, which makes quarterly, bulk deliveries.

We did not see proceedings of recent Bangladeshi scientific society meetings. We noted in the course of our general enquiry that research reports were in short supply.

BARC aspires to be the national repository for agricultural literature. It publishes the annual Bibliography of Agriculture. We found BARC's library not up to date and not completely documented.

General appraisal: We have noted that BARC, the affiliated institutes and USAID are aware of the need of current, foreign publications. Acquisition lists have been submitted and funds have been provided. Although these actions are commendable, they will not provide a complete reference acquisition service. An annual budget of both Takas and foreign exchange is needed.

One of the functions of the BARC unit is to serve as a reference library for the affiliated institutes. At the present it does not have that capability. The need for such service should be reappraised. If the need still exists, BARC should make the appropriate world linkages to respond to it. That would include, among other things:

a) subscribing to the major agricultural bibliographies of the world;

b) making exchange agreements with the pertinent agricultural, livestock, fisheries and forestry libraries;

c) bringing the documentation of the library up to date;
d) publishing a monthly supplement to the bibliography.

3.1.5.2.2 Data management

(1) Background

The Project Paper specified an output to be:

> "A centralized unit within the research system capable of processing social and economic data generated by the agricultural research institutes."

Similar data management capabilities are needed to support the biological, hydrological, soil, social sciences, and research administration.

The project provided 21 person weeks of consultation on planning the data management system. A computer utilization advisory committee was established and met regularly until late 1986.

In 1985, fourteen IBM PCs were procured through the contractor. One of the machines was assigned to the National Agricultural Library and Documentation Center, one to the finance section, and one to the manpower and training division. The remainder of that order was held at BARC for training and data processing.

The machines were set up, and an operation training programme was started. A principal trainer was employed from July 1986 to May 1987. Several people took an introductory operating course. (We heard of a six months delay in participants from one of the institutes getting accepted for training.) The trainer also helped establish data bases, specifically the human resources inventory and requirements list.

Sometime during the project (before 1985) the strategy was changed from providing a project-wide data center to providing training, hardware and software to the institutes. The contractor ordered 20 or 25 more IBM PCs, which arrived in July 1987, two months after the end of the trainer's contract. One was destroyed in shipment, and three were damaged by water after arriving at the airport.

Twenty machines are in storage. Although a utilization plan has not been completed, we understand that there has been discussion of assigning three of the twenty to BARC and transferring seventeen to the institutes as they develop the capability to use them. The remainder of the BARC inventory would be retained for operation and training at the center.

In the meantime, several institutes which were to be supplied machines obtained identical or compatible computers with other resources.

BARC has a maintenance contract with IBM/TACA. However, three or four machines have been down for over a year. In the last days of this evaluation, the director of the center left for employment in the private sector.

(2) Outputs:

(a) Operators, programmers and trainers: A number of people were trained as data processors. At the date of our observation, there was a three-month course in programming in progress. The participants were from the Rural Development Board and the Agricultural Bank.

The trainers are not yet able to employ the full capabilities of the machines.

(b) Data processing: As a stop-gap measure, the center processes statistical data brought in by the institutes (BARI is their best client).

(c) Data bases: The center has data bases on:
- bibliography
- agro-ecological zones (done by FAO; not complete and not released)
- irrigation water supply
- rainfall since 1905
- human resources (NARS

(d) Financial management, including payroll.

(3) General appraisal

The PP revised output was only partially achieved. To sustain the present level of proficiency, the center must have continued external technical assistance for several years. While the present staff of seven is competent to operate and teach what they were taught, they sprang from a brief and narrow base. True, that once a participant achieves the basic operating principles, acquiring new programming skills and new languages is largely self-teaching exercises. However, we would expect the personnel at the center, at this stage, to have only limited programming and trouble-shooting skills. They are new at it, with minimal training, and they are operating in their second language. They need more awareness of machine care. They also need assistance in planning, supply management and budgeting, and more training in data bases, word processing, statistical packages, spreadsheets and programming languages.

The BARC center should have access to one or two highly skilled programmer/trouble shooters who provide regular, on-the-spot consultation to the computer users and operators at the institutes.

The staff is severely overworked, and we can expect a high rate of attrition as their skills develop.

(4) Recommendations

(a) Planning and guidance: The computer utilization committee should be reactivated and expanded to include all donors who provided such commodities to BARC and its affiliates. The hardware use and distribution plan should be kept current.

(b) BARC should carry out the plan to decentralize the work to the institutes. Scientists must process their own data for it to have meaning. With communications as it is here it would be next to impossible for a data center in Dhaka to provide adequate processing service to the institutes throughout the country.

(c) Technical assistance: Outside, day-to-day consultation on training and utilization must be provided to the center and the institutes. Such capability should be developed in-country if it doesn't exist already. We believe it does.

(d) The center should be adequately staffed to do its work, allowing for a high rate of attrition.

(e) Maintenance service: There are competing companies which provide computer maintenance services. If the present service is not satisfactory, other providers should be sought. Whether a maintenance contract is needed should be reconsidered: just call them up and pay them for services actually rendered.

(f) Training: We believe that BARC should concentrate on training personnel from the institutes before taking in people from other agencies.

3.1.6 BARC's Assistance To The NARS in Facilities Management, Commodity Procurement and Maintenance

3.1.6.1 Commodity procurement

3.1.6.1.1 Background

The contractor prepared all commodity lists and specifications, ordered through its home office, cleared customs and delivered to the users. Computers were delivered to BARC. There were complaints of delays in arrival (computers and books arriving after completion of the project, for example) and mistaken delivery. Although the contractor left a computer print-out of the commodities received and delivered, it did not show where the items went. There were no follow-up reports on the use and status of the commodities.

3.1.6.1.2 General appraisal

The contractor prescribed, imported and delivered an impressive array and quantity of commodities. However, this was done largely unilaterally without developing any capability in BARC to carry on. Whether BARC should have more responsibility for procurement under ARP-II-S is a matter for AID to consider. The institutes are in fact gaining experience in procurement with IDA funds: they simply get approval to purchase and buy off-the-shelf. (Example: computers from IBM-TACA. No problems.)

3.1.6.1.3 Recommendations

(1) Both BARC and the user agencies should be involved in procurement as much as the donor's regulations permit, first as an orientation to the use of the commodities.

(2) BARC and/or institute officers with technical assistance as needed, should follow the commodities to the points of use and give whatever assistance needed to get them properly used and maintained.

3.1.6.2 Facilities management and maintenance

3.1.6.2.1 Background

Station (thus, equipment) maintenance was an element of farm development in the project. Technical assistance in this area was posited in BARC as a logistical service that could be rendered to more than one institute. The contractor provided 36 person months of long-term, technical assistance and two months of short-term work, the latter for repairing laboratory equipment.

The project documents show that the contractor's farm development specialist spent most of his time with BARI and its regional stations. His outputs included equipment and spare parts inventories and maintenance manuals. BARC did not assign counterparts to work in farm development services.

Operating skills are also needed. We heard stories of apparatus declared broken when just a light bulb burned out and of computers declared broken when the operator could not clear the "ERROR" sign. We saw new instruments not in use, due to the limited skills of the responsible scientists. The operator of whatever instrument or machine should have first responsibility for its maintenance.

The contractor also provided four person-years of specialists' time in station management. They departed in 1985. Technical assistance in management is intangible, hence difficult to measure. We only noted that the regional research stations are yet in need of better management (Annex C).

3.1.6.2.2 General appraisal

The 1986 internal evaluation noted problems of getting counterparts for these positions due to the lack of prestige afforded those trained as research scientists and positioned as research administrators. That evaluation recommended foreign study grants as incentives for service. There is practical value in sending station managers, maintenance chiefs and certain classes of mechanics to IRRI, for example, to observe procedures and so on. However, the main attraction to the station management and maintenance positions is likely to be pay. Grade and salary schedules should be adjusted to attract and hold qualified personnel.

3.1.6.2.3 Recommendations

(1) Job analysis: We recommend a task analysis of the maintenance to be addressed by the project supplement. Competent computer service is available in Dhaka. Instrument repair is a concern. Whether the farm machinery shops graduated under ARP-II should be determined. What remains to be done should be described.

(2) Technical assistance: The job analysis would prescribe the kind and amount of technical assistance needed. It is possible that one, long-term specialist, with periodic, short-term assistance, would suffice. The long-term specialist's main objective should be to get supportive maintenance units institutionalized throughout the system. His or her secondary function should be to get operators and mechanics trained in maintenance philosophy and skills as time allows. The technician can teach maintenance skills in his or her specialty (instrument mechanics, for example). The last task of the technician should be to personally repair an instrument. He or she can show a Bangladeshi colleague how to repair an instrument if this is the ultimate available source of the skill.

Additional skills will be needed for shorter periods. A search for these skills should be made, first in Bangladesh, then in nearby countries, in effort to develop local or regional capacity to provide these services. BARC is still the logical service center.

3.2 ASSESSMENT OF OUTPUTS BY THE CORE DISCIPLINES

3.2.1 Introduction

Detailed explanation of all activities and achievements, including technical assistance, consultations, seminars, workshops, long and short term training, research, construction and manpower improvement, are in the 1983 and 1985 external evaluations, the 1984 and 1986 internal evaluations and the contractor's final report. To repeat those data would serve no useful purpose. Hence, we have reported significant achievements, trends and constraints we believe need special attention.

We examined project progress in each discipline in terms of project objectives and implementation bottlenecks.

3.2.2 Research by Core Disciplines

3.2.2.1 Economic and Social Science

3.2.2.1.1 Background

Prior to ARP-II, the economists at the Bangladesh research institutes did mostly production economics related to the specific crops of each respective institute. The senior economists had been trained at foreign universities. When cropping systems research was introduced, the economic studies broadened to account for all crop and rotation variables.

The objectives of cropping systems research were to: (1) determine optimal cropping patterns; and (2) improve the components of the patterns. The institute economist's job was to measure the economic returns to the patterns and their variable, component treatments.

The outputs of the economics divisions were limited, compared to the demand for economic studies in farming systems analysis. Their

studies - determined by the biological scientists they supported, where the typical project required five to seven years for fruition. Only BARC, BRRI and BARI had economics divisions. There were only a few Bangladeshi economists outside the academic circles who had adequate skills for independent research design and analysis.

The country possesed little, if any, capability in rural social analysis. Farming systems research requires economic and social analysis of all components of the household/farm system, the economic measurement of each component and its interaction with other elements of the system. It also requires analysis of the social constraints on system components. FSR brought on an explosion of demand for agricultural economists and rural sociologists or development anthropologists of the Scientific Officer (SO) level to work at the FSR sites.

Whether the project should have entered into farming systems research on the scale it did without these skills should have been considered. The contractor's specialist addressed the problem by designing and teaching courses in basic statistical analysis. He followed up by assisting the participants to design, implement and report short research projects (hands-on field training).

The project provided 22 person months of expatriate consultation in development anthropology, including 12 months in the study of the role of women in household/farming systems. A Bangladeshi anthropologist, at Dhaka University, retained by BARC, with the help of a consultant provided by the contractor, made study of the role of women in Bangladeshi household/farming systems. These studies left no residual skills except perhaps in Dhaka University. The reports have not been incorporated into project activities.

3.2.2.1.2 Outputs

(1) Trained personnel: The project trained 344 SO's in one or more basic analytical skills or research techniques.

(2) Farming systems research: By 1985, the active FSR site teams were making simple but systematic enquiries of farming systems. The first surveys were to identify farm size and farming systems. A few household/farm accounts were monitored. Some investigators made market profiles. One group started commodity price series at rural markets. Other studies included cropping patterns, cropping intensity, draft animal distribution and the typology of fertilizer use.

BARI and BRRI are each monitoring household/farm receipts and expenditures. BARI has proposed to begin household/farm credit studies this year.

A few of the current contract research proposals are for socio-agro-economic surveys of specific crops. This is a welcomed suggestion of interdisciplinary cooperation which has not been notable, either in field operations or in the research reports. We have not seen any proposals for the social scientist, the crop scientist, the animal

scientist and the local extension agent to implement a long-range farming systems research project with the stated objective of finding or developing ways of socio-economic betterment by the farm households in the areas studied. (If the BAU team at Kazirshimla is not now an exception to this statement they soon will be, as they appear to be functioning as a team.)

The project titles indicate that most enquiries were commodity research with an on-farm orientation. At this state of farming systems knowledge by the project participants, these may well be the appropriate enquiries. However, systems research requires that all elements bearing on the objective, which should be to aid farm households in achieving their goals, be considered in unison.

Many economists' positions have been vacant for some time (Annex C). Of sociological enquiry, we noted a household task analysis and a catalogue of traditional farming practices. The investigators at Kazirshimla touched on the social constraints to certain farming systems components (ducks, pigeons, goats). We mentioned the Bangladeshi study of rural women, above.

The studies cited above are examples. There are many more projects, as FSR created the demand for the work and PL-480 funds made it possible and attractive.

3.2.2.1.3 Quality of designs

The quality of the economic research we saw varied greatly, no doubt reflecting the skills of the investigators and the assistance they got from the base institutions. (Our RRA recorded complaints of little or no field supervisory assistance from the principal investigators).

In general, the basic systems typology surveys (farm size, farming systems, etc) were good. Some of the surveys relied too strongly on prompted response for a high level of validity and too strongly on the respondent's memory for a high level of reliability.

We commend the young investigators for making the start. The SO's we saw are eager to learn, and they will improve, depending on the assistance they get.

3.2.2.1.4 Appropriateness of plan

The plans we saw were the annual work and financial plans, which had more of a budget function than the pursuit of an objective. The training activities were to the extent that time allowed, progressive. They tried to "institutionalize" the short courses in statistical analysis in the higher education institutions, even though the courses were non-credit and unacceptable to the academicians.

We also commend BARC and the contractor for following the SO participants back to their sites and helping them get started with their research.

The BARC economics and social science division also has a practice — not articulated in a plan — of assisting the economics and social science divisions of the institutes with their annual programme reviews. This is commendable.

We could not discern a plan, either by BARC or by the cooperating institutes, for progressively implementing a complete farming systems research programme nationally or at a given site. As a result of this, perhaps, the economic enquiries are incomplete and generally non-progressive. Most of the socio-economic research underway is funded by BARC with USAID or IDA resources. The institutes and BAU submit proposals for small studies annually. Each institution submits a large number of study projects of about equal significance, expecting some to be denied. The result is a marketing effort rather than a response to a plan.

3.2.2.1.5 General appraisal

(1) Plan: The economic and social science element of BARC operated on the basis of a general understanding by its leader and an annual work/budget plan. We believe a comprehensive, long range plan is needed to provide guidance in research design and approval. We are aware that BARC is making a twelve-year, master plan. This is needed. We hope it includes helping the FSR site teams make life-of project plans, so they, as well as BARC, will know what they should do, when they should do it and when they shall have finished.

(2) Training: The project focused a broad application of economics to the solution of rural, household/farm problems. This was accomplished by providing intensive, cookbook-type courses to people whose academic skills were inadequate for the job. The contractor's economist repeated the basic courses in statistical analysis many times on many campuses, He tried to "institutionalize" the courses. To no avail, predictably, as the syllabi had not been approved by the academic bureaucracies. Bangladeshi teachers capable and willing to teach the courses could not be found. When the contractor's economist stopped teaching, the courses stopped. This raises the question of whether he should have spent his tour teaching field workers or training teachers.

The contractor's specialist recommended "institutionalizing" elementary probability statistics, matrix algebra, calculus, multiple regression, sampling, micro-computer operation and report writing. With exception of the micro computer, if investigators do not have these skills they cannot do scientific research. To complete the list, we add social systems survey and analysis.

Few, if any, of the 344 SO trainees had more than one of these courses. There is a big turnover among SO's at the FSR sites. The higher education institutions will not likely academically approve these courses during the life of ARP-II-S. However, their professors would likely teach the courses on contract. BARC could deliver a syllabus to a university and/or a professor with a request for an offer to teach it to specified clients, i.e. SO's in pre-service or in-service training. The

institution would be paid an overhead fee, the professor would be paid for his extra-curricular work and the SO's would be paid while taking the courses. The precedent has been set in contract research.

(3) Field support: BARC's record of field support in economic studies is commendable. However, we noted that the institutes have not done as well at supporting the FSR site workers. BARC should form a team, consisting of at least two of its permanent officers and the contract persons to be supplied in the ARP-II-S to spend at least half time assisting FSR site workers. In the process, they should train institute headquarters officers, who would accompany them to carry on the supervisory guidance and assistance.

(4) Rural social enquiry: The project accomplished very little in rural social research. Rural social systems research should be integrated into the national programme and the FSR site studies during ARP-II-S. This can be done through intensive training and follow-up during the life of the project.

Although there are two or more valid approaches, we recommend social systems analysis for the FSR programme. Logically, farming systems are subsystems of social systems. Among other phenomena the enquiries should include:

(a) internal linkages and boundaries;

(b) power structure;

(c) roles, including informers, innovators, legitimizers and tension managers;

(d) status (rank);

(e) goals;

(f) social constraints to goal achievement, including constraints to farming systems component additions and substitutions.

These enquiries should define the appropriate areas of work and identify the proper linkages between the FSR site personnel and the social systems they invade. Limited work at one site confirmed the general assumption that women are disadvantaged vis-a-vis men in Bangladeshi rural social systems. Women worked more hours per day than men, and as hired labourers, received less pay than men. The roles and social status of women would be shown along with all other members of the system. Then the women alone could be treated as a subsystem to which the entire schedule is applied. This exercise would likely reveal linkages that could be used to implement profitable, yet acceptable economic programmes among them.

(5) Technology diffusion studies: BARC and its affiliates should track the spread of new technology as an aid to the extension services and do benefit: cost analyses of the development and diffusion of

new technology. The extension services need to know typical linkages between informers and receivers. Among helpful questions:

(a) from where to where did a technique or practice move

(b) linkage between informer and receiver

(c) time lapse from the original availability of the technique in the country to the informer and end user;

(d) validity and reliability of the communication

(e) roles of the informer and the receiver;

(f) personality profile of the informer.

These role incumbents could be sought in negotiating on-farm trials and information support. BARC and the Directorate of Agricul tural Extension (DAE) should cooperate in designing a uniform project that would reveal regional and national patterns of information movement.

3.2.2.1.6 Recommendations

(1) Agricultural economics: We recommend posting a farming systems economist (production economist who knows systems analysis) at BARC/Dhaka. He would counterpart with the member/director for economics and social science and two of his staff. The specialist and the latter two should spend at least 50 percent of their time in the field, working with all associated programmes.

(2) Sociology: Since the sociological dimension of the project was neglected under ARP-II, we recommend that the project provide the full-time services of a sociologist for four years. The person should be a woman, because in rural Bangladesh society, women cannot easily communicate with men from outside their families. Additional, short-term consultation will be required.

BARC should employ two women counterparts trained in sociology, anthropology, agriculture or animal production. Their field work should center at Mymensingh where they would initiate research and devise and test programmes including women. As they develop research procedures they should train associates at BAU to teach the procedures to FSR SO's brought in. The idea is to incorporate a conveniently situated FSR site into an organized training programme. (The programme should include production economics and could include other disciplines.)

Somewhere in the course of the project, the workers should be moved into the economics and social science division offices at BARC, where they could more centrally support the total programme.

There is a desirable alternative approach that should be

pursued: Continue to center the effort at BAU and underwrite them in supporting the institutes.

The women counterparts who excel in this activity should be sent abroad to pursue the Master's degree in rural sociology and development anthropology. Cornell University and the University of the Philippines are recommended.

Short-term assistance should be provided to assist in designing and implementing the first social system survey and in designing and implementing the technology diffusion survey.

3.2.2.2 Crop Science

3.2.2.2.1 Background

Approximately 80 percent of the total cropped land is devoted to cereal production. Because of the population intensity of 2000 persons per square mile there is little opportunity for increasing agricultural production through new land. The hope of meeting food needs lies in higher crop yields, crop intensification or food imports. While some increases in cropping intensity occurred from the 1960s to early 1980s, it is now static at about 150 percent. Further crop intensification will depend primarily on the expansion of irrigation to permit crops to be grown during the dry season.

Population increases and lack of industrial employment opportunities have reduced average farm size to about 0.9 hectare. The farms are generally in fragmented holdings.

The introduction of high yielding varieties (HYVs), chemical fertilizer and irrigation have provided the key improvements to the two primary grain crops, rice and wheat. Boro paddy was increased via irrigation; transplanted Aman crops replaced broadcast Aman crops in drained areas. Wheat and cash crops have replaced dry season pulses and oilseeds.

The two primary institutions involved in crop research in Bangladesh are BARI and BRRI. BRRI has been eminently successful with rice, so while U.S. assistance to BRRI continued under ARP-II, emphasis was on strengthening other crop programmes and their relation to a rice dominated agriculture.

BARI, created in 1976, has the mandate to conduct research on cereals, pulses, oilseeds, cotton, tobacco, vegetables, fruits, roots and tubers, fiber and spices. The rapid rural appraisal (RRA) indicates recent production trend for crops.(Annex C). BARI also conducts research in post-harvest technology, fertilizer and pest management, farming systems, soil and water management, and farm machinery. The Institute is structured into 12 research divisions. The headquarter is at Joydebpur with 182 hectares for building and experimental field plots. There are four regional agricultural research stations and 19 sub-stations. BARI has research staff of 557. There are 45 Ph.D. and 347 M.Sc. degree

holders. Large specializations are in plant breeding (111), agronomy (111), and soil science (109).

BARI's overall research objectives are:

(1) to identify and develop improved varieties of crops and recommend their adoption after rigorous evaluation;

(2) to improve and develop cultural practices and water management for higher yields;

(3) to investigate plant nutrient requirements, evaluate the capacity of soils to meet them and develop fertilization practices;

(4) to assess damage to crops, products and losses caused by pests to develop effective methods of control;

(5) to develop and improve cropping systems to optimize crop yields and farmer's income;

(6) to investigate and develop appropriate tools and machinery that will contribute to greater productivity of farm labour;

(7) to investigate the profitability of competitive crops and cropping systems, determine resource use efficiency and identify constraints to adoption of improved technology;

(8) to develop a coordinated system of on-farm testing to disseminate and evaluate packages of new technology.

3.2.2.2.2 Appropriateness

Since 94 percent of the income from Bangladeshi agriculture is derived from crops, it was appropriate for ARP-II to address the challenge of improving agricultural research capabilities in crop science. The project focussed on training beyond the baccalaureate level, developing improved varieties and improvement of selected crops by crop/soil/water and pest management, and developing improved crop production packages or technologies for farming system programmes.

3.2.2.2.3 Outputs

(1) Trained personnel: The provision of foreign, graduate-level training in crop disciplines for 15 scientists, plus 15 others for shorter periods, may be the most important long-range contribution of the project. The second may have been the numerous short courses, workshops, and conferences for research and extension personnel in wide-ranging subject matter.

(2) Wheat improvement: A major crop success story has been the introduction and improvement of the short straw, high yield index, fertilizer-responsive wheat germ plasm introduced from CIMMYT. From 120,000 ha in 1974-75, the area under modern varieties in now about 600,000 ha. Total production increased from 100,000 tons to a million tons during the period, and grain yield from 0.8 to 1.67t/ha. Sixteen wheat varieties were released. They are resistant to the local diseases, leaf rust and leaf spot. Over 96 percent of the wheat area is now planted with modern varieties. Some surveys indicate that 85 percent of the crop receives fertilizer. BARI formed task forces of scientists including breeding, agronomy, water management, economics, crop physiology and entomology to work cooperatively on wheat improvement.

Agronomy trials have indicated optimum planting dates for the crop and that minimum tillage practices may be used successfully.

Unanswered questions are the long range effect of the replacement of pulse and oilseed crops by wheat on diets and income and whether the recent leveling off of wheat production is temporary. This may be due to wheat moving more into rainfed areas, resulting in lower yields. Genetic improvements to further increase yield under unfavourable growing conditions are now necessary.

(3) Maize improvement: Three varieties of maize composites were released in 1986 by BARI. They yielded 4-6 T/ha in experimental acreage. Development of the maize crop would support the poultry subsector.

(4) Oil seeds and pulses: Recently, mustard and groundnuts have received research priority; and among then pulses lentil, chickpea, mungbean, blackgram and lathyrus have received attention. Annex E shows the varieties of these crops released by the Bangladesh National Seed Board, 1981-1987. Mustard lines with higher oil and protein content have been identified.

Early mungbean and chickpea varieties which offer hope in increasing crop intensity on land used before and after T. Aman rice are now available. Several lathyrus lines have been identified in laboratory tests to be low in neurotoxin which is reported to cause an illness (lathyrism). Progress was made in management studies that showed promise for the use of pulses in intercropping studies leading to increased yields on land equivalent ratio. This would also provide much needed protein in the diet. Other studies identified optimal planting dates and weeding time for the various pulses. Drying and storage studies showed that seed viability can be maintained by simple, on-farm methods. Fertility studies identified proper rates for optimizing yield on different soils.

(5) Roots and Tubers: White potato, sweet potato and the aroids are priority crops in this programme. Several improved varieties have been released in recent years (Annex E). Yields of improved potato varieties have reached 20 to 30 T/ha in both experiment station plots and farm fields. Sweet potato varieties with higher yield and carotene content are now available. Potato production has steadily increased due to

improved varieties and disease free planting stock, and we believe it will continue. These accomplishments were an output of assistance by the International Potato Center (CIP) not ARP-II.

(6) Miscellaneous observations: Certain crops are relatively new introductions to the country sunflower, maize, and soybean. One agronomy specialist was assigned to rainfed crops and reported good potential. We see these crops offering opportunity for livestock feed, rather than food. Their future production will therefore depend on development of the livestock sector.

Promising intercropping and relay patterns were noted on the research stations. Maize interplanted with pulses, and vegetables such as chilies may also provide greater production per land unit area. These intercropping patterns are now on FSR sites and some have been accepted by nearby farmers.

3.2.2.2.4 General appraisal

Crop specialists actively participated in annual workshops in research planning and evaluation at the station and institute levels. As a result we noted the research objectives and justifications become better focused during the life of the project.

Direct funds were used to help alleviate soil drainage problems on a section of the BARI headquarter farm to permit vegetable crop evaluation. The home garden programme at the Ishurdi RARS was provided technical assistance by the contractor's specialist stationed there. This activity is being monitored as a model for other home garden programmes.

Crop specialists and consultants participated in the preparation of 29 publications on a wide range of crop research subjects. Many of these were planning and evaluation documents for specific crops or programmes. Training materials were also upgraded.

The three associate production agronomists stationed at the RARS were effective in day-to-day training of the local research and extension officers. This included research planning, experimental design, implementation of field trials, analysis and interpretation of data, research report writing and verbal presentations. They also helped organize seminars, internal workshops and reviews and field days.

Our general appraisal of the projects contribution to the crop programmes is positive. A positive attitude and self confidence was detected among the crop scientists, particularly the breeders. They had well-formulated goals and objectives.

One bottleneck noted was that frequently there was no qualified counterpart provided. This situation should be improved in ARP-II-S due to returning trainees. Secondly, the specialists in ARP-II-S should not have to spend so much time in actual teaching, conducting research,

and writing publications as in the past. This is due to the accomplishments in ARP-II.

3.2.2.2.5 Recommendations

(1) The rice, maize, wheat and potato programmes should continue to work closely with IRRI, CIMMYT and CIP, respectively. Linkages should be sought with other international centers. This will allow crop breeding programmes to remain at present levels.

(2) A major component in all crop breeding programmes should be the incorporation of genetic resistance to indigenous pests, for therein lies the cheapest control measure for the farmer, and it is environmentally safe. Cultural methods of pest control, such as modified planting dates and intercropping, should continue to receive attention.

(3) More attention should be given to variety improvement under moderate input levels, the objective being to obtain the optimal economic yield with minimal risk.

(4) Since Bangladesh agriculture is primarily crops and will remain so, priority training and research efforts must remain with crop science.

(5) Crop research, from breeding to variety release, requires a long period. A new variety often takes 10 years to develop. Because of the greater variability in this country's soil and weather, the confidence levels from field experiments are lower than in other agricultural regions. Hence, replicates of experiments are needed over both time and space. Computer data banks need to be assembled on soil and climatic characteristics and crop growth models fitted in them to reduce the time and expense of developing reliable farm technology. This is an appropriate support service that could be supplied by BARC.

(6) We recommend that the private sector become more active in seed multiplication and distribution. The profit motive generally leads to a better quality product.

(7) On-farm research of an area should be closely coordinated with, and backstopped by crop research at the regional agricultural research station (RARS).

(8) The importance of the regional research stations for conducting research is paramount. Therefore, well-trained staff and facilities must be present at them.

(9) Cropping intensity must be increased, either through irrigation, improved water management or the introduction of earlier or drought tolerant crops in the pre-and post-monsoon seasons. Shortening turn-around time between crops by minimizing tillage or relay planting are appealing research areas.

(10) A vexing challenge remains in vegetable seed production. A linkage with the Asian Vegetable Research Development Center (AVRDC) is needed, as proposed in the ARP-II-S.

(11) The potential of alley cropping should be researched in the Chittagong hill and Barind tracts. This systems approach can supply plant nutrients to interplanted crops, provide firewood, and aid in erosion control.

(12) Short duration fodder and green manure legume crops should receive attention in the pre-and post-monsoon seasons.

(13) Attention must continue to be focused on storage problems, particularly with the pulses and oil seed crops.

(14) Maize scientists should continue to work on the improvement of composites, rather than hybrids. Agricultural economists should construct prediction models on maize, given certain market prices, yields and livestock demands. The same should be done for soybeans.

(15) Although recent successes in on-station vegetable trials were not apparent, reports of the new home garden programme were favorable. We are pleased to note that a horticulturist is included on the ARP-II-S team. A specialist in breeding horticultural crops would benefit the project. Lack of vegetable seed availability in-country is a present constraint.

(16) Tissue culture research is slowly developing at BRRI, BARI and BINA. However, we believe that this is one area where both technology and materials could come from international centers. The principal crops that have benefitted from tissue culture thus far have been the root crops, and other vegetatively propogated crops.

3.2.2.3 Rice Research

3.2.2.3.1 Appropriateness

No agricultural development in the country can overlook the rice crop. ARP-II supported two specialists, training, contract research, and commodities for BRRI.

3.2.2.3.2 Output

The rice yields and total production figures continue to increase although at a declining rate (Annex F). BRRI has developed 20 improved varieties. In 1985-86 these HYVs rice were grown on 28 percent of the rice area and provided 44 percent of the total production. The rice production growth rate from 1974 to 1986 was around two percent. Both the quality and quantity of rice research is high. A 22-year association with IRRI has helped. But the success rightfully belongs to the breeders of BRRI who introduced IRRI germ plasm and adapted it to local stresses and pests.

3.2.2.3.3 General appraisal

Rice research is a success story, and should continue to receive strong support through IRRI. (A brief history of rice research in Annex D.)

3.2.2.4 Soil Management

3.2.2.4.1 Appropriateness of plan and design

The objective, basically, was to improve research in all aspects of soil management. The broad areas are listed in order of priority:

- development and management of a national soil fertility evaluation and improvement (SFEI) programme;
- improvement of other soil management areas, including soil microbiology, soil physics, soil salinity, tillage practices, and soil and water conservation and management;
- offering analytical services, research information and cooperative research to the FSR programme by integrating the above objectives.

The priority areas were in need of support and quite essential in any crops/agronomy research programme. However, the soil fertility evaluation and improvement programme has one aspect that we are convinced will not be successful. This is discussed below.

3.2.2.4.2 Outputs

(1) SFEI: A great deal of effort went into this element of the soil management programme. Funds from BDG, AID, CIDA, and IDA were committed for laboratory renovation, greenhouse construction, analytical equipment, long term and short term technical assistance, many workshops, training, research trials, publications, and greatly improved soil analytical capability. Soil series were sent to the United States for analysis and "sorption" studies. The central laboratory at BARI, by 1986, reportedly could run 300 samples a day with 12 accurate determinations. This is an essential service to researchers, and it also can be used to expand the data base on Bangladesh soils.

(2) Other programme areas:

(a) Soil microbiology: Several consultancies, many commodities, contract research and extension training, all can be listed as accomplished activities. However, we have neither seen nor heard of any research in Asia which demonstrated significant yield increases from rhizobium applications.

(b) Soil physics, soil salinity, soil conservation and soil management: Consultancies were arranged, training sessions held, commodities procured, and research projects developed.

(c) Tillage practices: After three consultancies and an international symposium, numerous research projects were carried out by the On-Farm Research Division (OFRD) teams at the RARS. Types of reduced tillage have increased yields, possibly by conserving residual moisture.

3.2.2.4.3 General appraisal

(1) The soil laboratory: Although the laboratory was designed for 300 samples a day capacity, little activity was observed the day we observed it, although the receiving and preparation rooms were overflowing with samples. Most of the equipment was reportedly functional. We heard complaints by OFRD researchers stationed at the RARS's that samples sent to the laboratory were either lost or that the analyses returned late, hence project reports were published without soil analyses. We urge that every effort be made to maintain this valuable laboratory. BARI should not fund any crop research without soil analysis in the methodology.

(2) Soil microbiology: We recommend that AID does not further support rhizobium research until reliable data conclude sufficient value.

(3) Fertilizer recommendations: Within the SFEI programme BARC, encouraged by the contractor's soil fertility experts, prepared the Soils and Irrigation Publication No. 19 entitled, "1985 Fertilizer Recommendations Guide for Most Bangladesh Crops". The guide is designed for use with soil analyses of farmers fields. It is our opinion that this strategy is doomed to failure, because, inter alia, the vast majority, say 95 percent, of farmers will not have access to soil analysis. Those who do would not receive their analyses in time nor could they interpret the analyses.

Most Asian countries have published regional recommendations based on soil types, experiment station responses and known plant nutritional needs. This is the first time we have encountered recommendations based on farmers having access to soil analysis.

The problem in Bangladesh of correctly recommending fertilizer ratios for farmers' fields is extremely complex. First of all, the farmer may cultivate up to five scattered, micro-plots, each having different nutrient deficiencies. Normally farmers have an average cropping intensity of 1.50. This means he has to calculate over 7 fertilizer rates a year.

Unfortunately, the farmers have many fertilizers to apply. The majority of rice farmers now have two nutrients (N-P) they know will be needed and three (K, Z_n, S) that might be needed. To add all five is most likely a waste of money. To leave out that which is deficient lowers the efficiency (the law of limiting factors) of all the

rest, thus reducing yield. To evaluate the correct rate of application of five separate fertilizers for five separate fields (25) would be a challenging exercise for new BRRI scientists and virtually impossible for illiterate farmers.

We recommend that the following avenues be investigated in an to reduce the complexity of the soil fertility problem:

1. All soil management research should be conducted on known, major soil series, and complete soil analyses should be required. Where possible, plant tissue analysis should be included. Correlate soil analysis, fertilizer application, and yield. These data should be fed into a central data base to increase knowledge of the major soil series in order to prepare regional recommendations.

2. Experiments should be structured to seek to reduce the nutrients required. For example, in an elaborate greenhouse trial, using the major soil series, potash was found deficient in only 50 percent of the soils and statistically and economically needed in only 30 percent of the soils tested. Hopefully, with more careful trials, potash can be taken out of the recommendation for 70 percent of the farmers. The same goes for zinc and to a lesser extent for sulfur.

3. The sulfur problem can be corrected by convincing the manufacturers to return to the production of superphosphate, which contains sulfur, rather than tripple superphosphate, at least for sulfur deficient areas.

4. It is critical that the whole question of formulating mixed or complete fertilizers be looked at in the light of the needs of farmers and not in the light of cost benefit ratios of fertilizer manufacturing. Regional formulating plants could accommodate regional recommendations.

5. We recommend that the International Benchmark Sites Network for Agrotechnology Transfer (IBSNET), University of Hawaii, be invited to develop, or to determine if data are available to develop, a Decision Support System for Agrotechnology Transfer. Resource-poor farmers do not use technology because it doesn't exist but rather because the means of identifying appropriate technology for each crop, on each micro-plot and for each season have not been available. The use of trial-and-error methods (field trials) are extremely costly and have not been successful. It is not sufficient to know that a fertilizer application increases yield:the farmer should know the approximate cost:benefit of each increment and how to maximize benefits by altering cultivars, planting dates, irrigation and integrated pest management. With a minimal data base of weather, soil and crops, a decision support system can reveal alternate strategies in a short time.

3.2.2.4.4. Recommendation on soil management research

(a) That research on urea application be undertaken. The present rice fertilizer recommendation is for the nitrogen application to

be split into three broadcast applications. The first one-third is to be applied at tiller initiation, the second third at the rapid tillering stage. The third portion is to be broadcast a week before panicle initiation. We hope the farmer can predict when panicle initiation will occur.

Research at IRRI shows that at least 60 percent of broadcast urea is lost, either to the atmosphere or in groundwater. BRRI should do research on application methods that incorporate the urea where the rice plant can absorb the nitrogen.

(b) That a study be conducted to determine what the farmers would have to pay for the recommended fertilizer rate for their region, whether they could afford to purchase the recommended fertilizers, and what the farmers intend to purchase and apply.

(c) That complete, mixed fertilizers be formulated for the most common, basal recommendations for rice.

(d) That BARC and BARI insist that all soil fertilizer/crop yield research trials include soil analysis data. The soils laboratory at BARI should be used for this purpose. The data from these trials should be sent to a central, soil data base and be incorporated in an agro-ecological map.

(e) The concept of using soil analysis of a farmer's field to determine his specific fertilizer requirements should be terminated as logistically impossible.

(f) A manual of major nutrient and micronutrient deficiency symptoms for major crops with narrative descriptions and color pictures should be published.

(g) Scientists from IBSNET should be invited to investigate the availability of soil, weather and cultivar data to generate data bases for crop production systems.

3.2.2.5 Water Management

3.2.2.5.1 Background

Irrigation and water management was the largest programme component of ARP-II. This enabled the recruitment of 62 persons, (four specialists and 58 consultants) for a total of 139 months. They served one week to 46 months. At different intervals, teams of consultants arrived to evaluate irrigation needs and water management problems. The largest number of contract grants also took place in this programme.

Ten broad, interrelated issues pertaining to irrigation and water management were addressed: ground water, pumps, water distribution systems, irrigation of crops other than rice, irrigation of problem soils, social and economic issues, research and extension linkages, development of personnel and institutions, monitoring and evaluation, and policy issues. The accomplishments are described in the RRA (Annex C)

and in the 67 reports by consultants. A synopsis of project recommendations and status was prepared by Garces and Haq in September 1986. That report covers 25 consultants and 135 recommendations.

3.2.2.5.2 Appropriateness

Water management is the key to agricultural productivity in Bangladesh. The country has either too much water during the monsoons, or too little water during the two dry seasons, i.e., post-monsoon or winter and pre-monsoon or early summer. Therefore, priority was given to this area and particularly during the latter two years of the project.

3.2.2.5.3 Output

The accomplishments were primarily in the training, lectures, workshops, and hands-on experiences presented by the specialists and consultants. They designed and taught courses at BARC, BARI and BRRI, attended by research and extension personnel. Long-term specialists helped develop courses. Research improved during the life of the project. Bangladeshi staff are continuing to teach the courses. Twenty-two Bangladeshi staff were trained outside the country.

Long-term specialists assisted in long range programme planning, research design and implementation, data analysis and interpretation and reporting results.

Research methods and research priorities in irrigation and water management were the subjects of annual conferences. Proceedings were published. A bibliography of water laws in Bangladesh was prepared and needed new regulations were called to the attention of BARC.

One consultant addressed ground water quality and monitoring. The greatest concern for the future appears to be salt intrusion in areas where the water table has been drawn down by excessive pumping. Thus far, it appears that agricultural pesticides have not entered groundwater, but this should be monitored in sandy areas with shallow acquifers and under certain cash crops, such as tobacco and cotton, which receive large applications of chemicals.

3.2.2.5.4 Appraisal/Constraints

Water management recommendations were often beyond the control of BARC, due to the involvement of several ministries.

Demand areas and the type of tube well installations (deep or shallow) must be more carefully zoned.

Pumping equipment has not been standardized, and often power requirements are not properly matched with depth to water.

Too often, technical information on either mechanical or manual pumps does not reach the farmer, although local language manuals with pictures have recently been prepared by the extension service.

Simple, economic solutions to water quality problems such as salinity are yet to be found.

There were at least 47 different research projects, 17 of which were under BARC. Simply monitoring this number of projects was a challenge to the project.

The water management/irrigation specialists arrived late in the project. Several consultants were here for such short periods that the development of good counterpart relationships was difficult.

3.2.2.5.5 Recommendation

To analyze the 135 recommendation and design a strategy to implement them will require further consultancies under ARP-II-S. We recommend that BARC review and resolve the many recommendations it already has and make the many reports widely available. There is need for additional training of extension staff and simple picture booklets for farmers.

3.2.2.6 Pest Management

3.2.2.6.1 Appropriateness of plan and designs

The projected outputs were:

-- methods and strategies developed, tested, and extended which reduce pest damage to crops;

-- improved research facilities and research staff capabilities to monitor pests, pest control technologies and make recommendations that are effective and ecologically safe;

-- personnel trained in integrated pest management (IPM);

-- a national pest control programme with staff capable of implementation at the field level.

The BARC master plan prepared in 1982, identified these priority areas:

-- identification of major pests and estimates of damage;

-- establishment of a surveillance, monitoring, and reporting system;

-- research methods of pest control appropriate for on-farm trials and FSR.

The above priority areas and expected outputs are still valid objectives. With minor exceptions, the tasks are not complete. The programme was much too comprehensive to be accomplished in the life of the project, even without the problems that ensued.

3.2.2.6.2 Outputs

(1) Personnel: The pathologist arrived in late 1983, and left in late 1985. The entomologist arrived in the spring of 1984 and stayed until the summer of 1987. The schedule of short term consultants fell very shy of the annual work plans. The pathologist was not in-country long enough to complete the tasks he began. The entomologist achieved much more but ran out of time before the system became functional. All activities were centered at BARI headquarters. During the life of the project there was a total of 46 person weeks of expatriate consultancies. The emphasis was on integrated pest management (IPM) (17 weeks), toxicology (14 weeks), pest surveillance and monitoring (11 weeks) and research planning (7 weeks).

(2) Training: Seven BARI staff were sent for Ph.D. level training. Six have returned. Four M. Sc. training positions were initiated and two have returned. The project met its targets in degree training. Short term training out of country and in-country fell short of projected goals.

(3) Contract research: With the increase in the trained manpower the BARI plant protection unit increased its cooperation with the various crop breeding programmes and began work on surveys. They have not progressed to the point of cooperation with the OFRD. Very few of the projected funds for contract research were utilized.

(4) Toxicology laboratory and commodities: The toxicology lab was renovated. The equipment has been delivered, but the technicians left before the equipment was installed. BARI has requested technical assistance for the lab, more equipment and training.

(5) Pest management manual: The expatriate entomologist and the BARI staff had almost completed a pest management manual when the entomologist's assignment ended. This manual should be completed and published.

(6) Denver Wildlife Research Center (DWRC): In 1986, it was proposed to extend USAID support of the vertebrate pest component for the duration of ARP-II-S. The four-year extension would allow DWRC to complete research now underway and to assist BARI in setting up implementation programmes based on the research results. We believe DWRC has planned and started very important research and has begun implementation very commendably. The most important problems under study are: (a) pre-harvest rat damage to rice and wheat (b) post-harvest mongoose and rat damage to stored grain and (c) jackal damage to crops and poultry. It

has been observed that rat populations vary in grain fields, depending on conditions of crop, cover, fallow, and flood. Considering the push for greater intensity of cultivation, hence longer periods of crop cover and food abundance, there is a strong likelihood of an increase in rat populations more difficult to control, especially with baits.

Recommendation: that AID enter into a four-year participating agency service agreement (PASA) agreement with DWRC to continue this important work.

3.2.2.6.3 General appraisal

The majority of the objectives in pest management were not met. Many tasks begun and not completed should be completed in the ARP-II-S. The work of DWRC is on track.

3.2.2.6.4 Recommendations

(1) That the toxicology laboratory be made functional, that equipment be installed and staff trained to operate the equipment.

(2) That the research instrument service cell at BARC be staffed and provided sufficient operating funds to maintain analytical laboratories throughout the NARS.

(3) That the manuals which the pest management consultant began, be completed and published.

3.2.2.7 Nuclear Research

3.2.2.7.1 Background

The application of radioisotopes and ionizing radiation in agricultural research began in Bangladesh in 1961, under the umbrella of the Pakistan Atomic Energy Commission, as the Atomic Energy Agricultural Research Centre. The centre became a division of the Atomic Energy Centre, Dhaka, in 1964. The Bangladesh Institute of Nuclear Agriculture (BINA) was established in 1972. It moved from Dhaka to Mymensingh in 1975.

Early funding came from the International Atomic Energy Association and SIDA. Recently, BINA has relied more on BARC and conventional agricultural donors. Only limited ARP-II funds went to BINA, primarily as contract research grants through BARC.

In 1984, BINA was assigned to the Ministry of Agriculture to conduct research in the nuclear area with potential benefits to agriculture. This included mutation breeding to improve crop varieties or develop new ones and development of methods or techniques involving nuclear

principles of understanding basic soil-plant-water relations. The present staff is made up of 48 scientists, including seven Ph.D. 32 M.Sc. and 9 B.Sc. degree holders.

3.2.2.7.2 Outputs

The institute developed and released two early maturing varieties of rice, Iratom 24 and Iratom 38, from selections originating from irradiations of IR-8 seeds in 1965. Binasail was released in 1987, a radiation mutation of Nizersail. Other rice mutants are being advance-tested and are to be proposed for release for cultivation soon.

A jute mutant, Atompat-38, with 15 percent higher yield than control, was provisionally released in 1980, and a chickpea variety, Hyprosola, having both higher seed yield and protein content than presently grown varieties, was released in 1981. Two strains of mustard, YS-52 and YS-67, and the dwarf tomato, Anabik, are promising. We found no data on the degree of acceptance of these varieties by farmers.

Recent annual reports contain a great range of agronomic studies on specific soil and crop problems. Notable are the various micro-nutrient studies which indicate widespread deficiences of zinc and sulfur in Bangladesh soils. Facilities for research with Rhizobia and tissue culture have also been installed.

3.2.2.7.3 General appraisal

BINA has gradually reduced its interest in the use of nuclear research for the benefit of agriculture, as funding has decreased in Bangladesh, as well as around the world. Part of this stems from the general disappointment following original high hopes for mutation breeding and a better method of measuring soil and water relations. While the neutron probe has been useful for measuring soil water and N-15 useful in understanding some aspects of plant nutrition, little new information has come forth in recent years. Varietal improvement via atomic irradiation has generally been disappointing, worldwide.

This is unfortunate, given the staff, facilities, and advantageous location of BINA, adjacent to BAU. The opportunity for shared science and graduate training is especially promising. We were generally impressed with the facilities of BINA, including a recently constructed greenhouse and construction underway for a soil microbiology laboratory.

3.2.2.7.4 Recommendations

BINA does not have the field facilities to test advanced plant breeding materials or other technology in the different agro-ecological conditions of Bangladesh. Their laboratories and staff should address more basic questions in areas that other institutes are either not concerned or not equipped to address.

Possible alternatives for BINA:

(1) Become the biotechnology or bioengineering institute for Bangladesh and concentrate particularly on the use of tissue culture for the benefit of agriculture.

(2) Initiate research in crop utilization, processing, storage and nutrition, and become a food technology institute or food research institute. This could involve value added research on Bangladesh agricultural products in cooperation with the private sector.

(3) Be carefully integrated with BAU and become the research facility for training BAU graduate students.

(4) If the present, wide ranging agricultural research programme is continued at BINA, a more direct linkage should be sought with BARI to reduce duplication of research in both in the laboratory and in the field.

(5) A last alternative would be to consider BINA a regional agricultural center. This would seem to be less palatable than the previous four, but it would utilize the present laboratory facilities.

3.2.2.8 Animal and Poultry Science

3.2.2.8.1 Bangladesh Livestock Research Institute (BLRI)

(1) Background

The Bangladesh Livestock Research Institute (BLRI) was created by ordinance in 1984. In June 1985, BLRI submitted a proposal to BARC to participate in the national farming systems research programme by implementing three FSR sites where livestock and poultry would be the focal consideration, and to provide an animal scientist (SO) to each of 19 FSR sites implemented by BARI, BRRI and Bangladesh Jute Research Institute (BJRI), thus contributing to their multidisciplinary teams. BLRI proposed six FSR projects for the three sites and left the activities at the sites initiated by the crop institutes to be determined by the respective, interdisciplinary teams. Research on growth rate, milk production, draft power, egg production, feed supply and production, health and mortality was suggested.

(2) Appropriateness of plan and design

In December 1985, an FAO planning mission completed a comprehensive Master Plan of Research for BLRI, which was subsequently approved by the Ministry of Fisheries and Livestock. The plan established systems research as the Institute's approach and method. As a systems frame, the plan is complete. It addresses the contribution of livestock and poultry to the farm household and to the national economy. The focal point of departure is the economic output of livestock and

poultry as one of several small farm enterprises, of which crops are most valuable.

As an example of its orientation toward small scale farming systems, the plan elaborates a number of hypotheses for improving homestead poultry production by developing non-competitive feed sources. At the same time, it excludes research in large scale commercial poultry production on the grounds that: (a) the development of an urban, commercial poultry industry would compete with the human population for scarce grain while benefitting only a few who have access to alternative enterprises; and (b) commercial poultry technology is available and readily transferable from neighboring countries.

(3) Outputs

(a) Seminar: In November 1986, BLRI was host to a seminar on the state of animal and poultry science in Bangladesh (First Annual Livestock Research Workshop). Seventeen scientists gave papers which bear directly on livestock or poultry as enterprises in Bangladeshi farming systems. The title of the proceedings suggests that this was the first multidisciplinary gathering of Bangladeshi scientists to consider livestock in farming systems. The scope of topics and status of the work reported (some in progress rather than completed) suggests that those proceedings were a fair summary of what was known about livestock and poultry in Bangladeshi farming systems at the time.

(b) BLRI sponsored farming systems research: One of the three proposed FSR sites which BLRI would implement was approved by BARC. Three or four of the six proposed projects were approved. This team, less an agronomist (requested from BARI) has been working, on site, since July.

In addition, a BLRI team of livestock and social scientists is interacting with farmers in the villages surrounding the Savar station. They are now surveying the roles of livestock and poultry in those farming systems, as well as the rate of adoption of certain practices of the Savar farm (i.e. crossbreeding).

(c) Participation in farming system research implemented by the crop institutes: BLRI hired the 19 animal scientists (SO's) last April, gave them a month's training and assigned them to 19 FSR sites implemented by the crop institutes. Obviously, this activity has not yet produced any outputs. It could be very productive if carefully nurtured. Although interdisciplinary research has been going on here at least as long as cropping systems research, this appears to be the first formal effort in joint-agency research. They have not yet worked out procedures for joint planning and monitoring. If this is not done soon, this effort at joint-agency research will fail. This would seriously limit farming systems research in Bangladesh.

(4) General appraisal

(a) The master plan: The PP said the project strategy was to approach its objectives through farming systems research. The

BLRI plan fits that mold. In fact it adds appropriately and considerably to systems research in Bangladesh.

Working with a new institution, unincumbered by vested interests, those planners were free to do it right. And that they did.

(b) Timeliness of actions: Although politics is the grist of democracy and the purpose of democracy is not necessarily to achieve efficiency in decision making, the political evolution of the livestock research programme to its present state has been too slow. The entire life of the project has gone by, largely waiting for Government decisions. Obviously, this has resulted in a waste of development resources. More important, it has deprived the Bangladeshi farmers of the promised outputs by that many years. If for no other reason, the contribution by the contractor's specialist on livestock was severely limited.

(c) Area requiring attention: The concept and practice of joint-agency research should be pursued from the director generals' level through every subordinate office down to the FSR sites. The Directorate of Livestock Services should be involved, and at the present, they are not. Each officer involved should understand the roles and responsibilities of all other participating officers and agencies -- that, for example, the livestock scientist assigned to an FSR site implemented by a crop institute is in fact implementing the BLRI research plan at that site and that the farmers of the site are the beneficiaries of the combined efforts of the two agencies.

3.2.2.8.2 Bangladesh Agricultural University (BAU):

(1) Background

BAU began investigating livestock and poultry as elements of its Farming Systems Research and Development Programme in 1985. They are operating at two sites, both supported by BARC contract research grants.

The guiding philosophy and approach of the programme flows directly from BARC, through consulting, training and literature as well as the University's experience in cropping systems. Contract research funds provided by BARC have been the enabling factor.

(2) Appropriateness of plan and design

They approached the study as an unknown system and worked from a census to specific components. Their objectives are to improve technology in the major established components.

(3) Outputs

For convenience, we investigated the work at Kazirshimla, which we assume to be representative of the programme. The first year, they made a profile of cattle, goats, chickens and ducks in farming

systems. They discovered some if not most of the constraints to these components in the Kazirshimla farming systems. They touched on the sociology of these species in farming systems. They are observing body weight and milk flow of cows as functions of helminthes control and nitrogen/energy (urea/molasses) intake.

(4) Quality

From the standpoint of scientific design and method, if ideal controls were the criteria, the project would rate rather low: small population, little or no standardization or randomization, limited control of subjects and so on. However, we are consoled by the fact that the farmers are not looking for small differences which these measures can't show, but large differences that they can see. The Kazirshimla team has made a start.

(5) General appraisal

We have concluded that the FSR team undertook the project with little prior knowledge but with open minds. In their first 18 months they have learned some lessons and adjusted accordingly. We believe that, other things being equal, they will continue to perform at the maximum level of their technical skills. We believe they would profit from on-site assistance by seasoned animal and poultry scientists.

(6) Recommendation

That the BAU FSR program be expanded to provide training, including research for the benefit of women.

3.2.2.9 Fisheries Science

3.2.2.9.1 Bangladesh Fisheries Research Institute (BFRI)

(1) Background

Fisheries research was not supported by ARP-II. We looked at it because it will be supported in ARP-II-S. The Bangladesh Fisheries Research Institute was established in 1984. Its objective is to provide component or enterprise technology to implementing agencies, including end-users, through joint programme review and planning, training and provision of "seed" materials (spawning stimulant and fry, for example). The areas of concern are:

(a) fresh water fisheries, including pond culture, paddy culture and pen culture;

(b) riverine fisheries management;

(c) brackish water fisheries management, including shrimp and mollusk production; and

(d) marine fisheries management.

NFRI is assisted by IDA, UNDP/FAO and the Danish International Development Agency (DANIDA). In 1985, an FAO team drafted a long term plan for NFRI, which was adopted by the Ministry of Fisheries and Livestock.

FAO is providing long-term, on-site technical assistance in research planning, aquaculture biology, hilsa production and culture, and brackish water aquaculture. IDA is underwriting the infrastructure, equipment, library and with DANIDA, adequate staff training. FAO is also providing about 100 person months of short term consultation, two months of which addresses farming systems.

(2) Appropriateness of the plan

In our judgement, the plan is entirely adequate to develop appropriate, component technology. We commend the planners for giving it a 20-year perspective. As it stands, the plan does not include farming systems research. Rather, it was designed to deliver component technology to the extension services. This includes providing enabling assistance. Commendably, it invites the extension services to participate in the year-to-year planning process.

The plans state that, "NFRI's programme is largely based on practically identical criteria" as BARC called for in its contract research activity: "...applied research of inter-institutional and interdisciplinary nature, directed towards solving farming problems of national priority status." Among other ways, NFRI subcontracts BARC-funded research to BAU scientists.

(3) Outputs

To date, the bulk of the Institute's efforts have gone to starting up, including planning, organization and construction. However, it cites exemplary success in adapting a technique for collecting and handling natural, hormonal stimulants to artifically initiate spawning.

On-station work is underway in fish reproduction, pond fish production, including fish-cum-ducks, and fish nutrition and feed.

(4) Quality

The work we saw appeared well-designed, clean and definitive.

(5) General appraisal

The NFRI purpose and plan is to develop improved, appropriate, component technology and deliver it to intermediaries, including the extension services. NFRI appears to have very good relations with both the Directorate of Fisheries Service and BAU.

Up to now, NFRI has not elaborated plans for farming systems research. The institute, BARC and USAID should jointly do this

before committing long-term technical assistance to such an effort, as anticipated in ARP-II-S.

3.2.2.9.2 Bangladesh Agricultural University (BAU)

(1) Outputs

The BAU team included fisheries in its farming sytems analysis at Kazirshimla and followed up with indicative trials of fish-cum-paddy and fish-paddy rotation.

(2) Quality

In fairness to the investigators, our judgement is based on only two of their projects. Those projects were not set up to measure variables. However, if as demonstrations they greatly excell over well-known, traditional practices, they will be just as valuable.

(3) General appraisal

While commending the investigators for their success to date, we believe they would profit from on-site assistance from fisheries scientists with research skills and experience.

(4) Recommendation

That NFRI and the BAU fisheries department provide on-site assistance to the FSR team.

3.2.3 Assessment of the Amount and Effectiveness of Training

3.2.3.1 Background

Training accomplishments of ARP-II will have the longest lasting effect on the Agriculture of Bangladesh, for the effectiveness of any agricultural research system depends on the quality and quantity of the manpower available. In December 1986, Bangladesh had 131 Ph.D. and 732 M.Sc. degree holders in nine research institutes and BARC. A high priority for training in ARP-II was obvious, given the importance of agriculture in Bangladesh.

3.2.3.2 Outputs

According to the contractor's record, as of April 1987, 247 persons had received foreign training and over 3,000 had participated in 494 in-country courses, conferences or workshops.

3.2.3.2.1 Technical assistance

Two training specialists participated in the project, one for three years (1982-1985) and one for six months. A training officer was appointed by the World Bank for the past two years. The early training specialists helped establish guidelines and procedures to be followed in the training of manpower to strengthen agricultural research. All specialists participated in training to various degrees and particularly in seminars, workshops, conferences and the preparation of syllabi and manuals. We noted that many of these are being continued on an annual basis at the research institutes.

3.2.3.2.2 Foreign training

Six candidates were awarded the Ph.D. degree and two will receive it in December 1988. Four were from U.S. universities and four from a Philippine university. Thirteen BRRI scientists received Ph.D. fellowships from a consortium of donors. Twenty-two foreign fellowships were awarded for M.Sc. training: six in the U.S., 13 in the Philippines and three in Thailand. A total of 74 persons took short term training courses of seven days to six months in the following countries: USA-40, Philippines-11, Thailand-15, India-4 and one each in Sri Lanka, Malaysia, Nigeria, and Swaziland.

Eighty-five persons attended international symposia, conferences or workshops of varied duration.

3.2.3.2.3 In-country training

Eighteen in-country, Ph.D. fellowships were awarded. Twenty-five scholars have completed their M.Sc. training.

Approximately 3000 persons received short-term training in specialized subject matter areas. These were mostly research and extension officers who will be involved with, or supporting new programmes. FSR divisions at the various institutions have held numerous training courses.

Summary of ARP II Assisted Training

Location	Graduate level Ph.D.	M.Sc.	Short-Term Training including conferences, study tours and workshops
Foreign	21	22	159
In-country	18	25	3155
Total:	39	47	3314

3.2.3.3 Appraisal of foreign training

We were pleased to note that both short- and long-term training was well balanced among several countries and institutions. This is commendable, for it prevents academic inbreeding and encourages new ideas and creativity in the class room, laboratory, and field. We also noted that some of the world's foremost agricultural universities provided the graduate training.

3.2.3.4 Appraisal of in-country training

Short- and long-term, non-degree training in-country was improved by the presence of project specialists and consultants who assisted in preparing course outlines and objectives, presenting lectures, and obtaining feedback from trainees. Some of the teaching materials prepared are now being used by local staff for the various research institutes.

In-country, graduate training was financed under ARP-II. However, we strongly feel that the overall calibre of graduate training must be addressed, and the sooner the better. Our observation of the research skills of field personnel led us to believe the quality of both undergraduate and graduate education is very poor. This is unfortunate, for these institutions should be producing well trained people to meet the needs of agriculture.

3.2.3.5 Training of women scientists

Seven women were trained out-of-country for four days to four years. A survey of scientists at various institutes indicated that women made up 5 to 14 percent of those staffs. Part of the reason for this low number may be the lack of women in agricultural training. Only eight to 10 percent of the 3500 students at BAU are women. The 1987 entering class for graduate studies at IPSA included seven women out of 160 enrollees.

3.2.3.6 Sabbatic training

Only nine scientists took sabbatic leave under this project. The leaves were all in-country. We heard that interest was low because the stipends were low.

3.2.3.7 Recommendations

(a) Training should continue to receive high priority by all donors supporting Bangladesh agricultural development, for therein lies the hope for agricultural science and food production.

The Manpower Planning and Development Summary should form the basis for future graduate training needs. However, scientific needs are not static. Periodic reviews should be made by the research institutes and BARC.

(b) Crop scientists who received foreign training and returned to their home institutes with new knowledge, techniques and a better appreciation of research in their particular disciplines, all seemingly have returned to headquarters. Perhaps this is necessary in the case of the Ph.D. holders, given the relatively few at the research institutes. However, we believe the effectiveness or contributions of some returning M.Sc. degree holders would be higher if placed at the regional research stations. Arrangements for local improvements or amenities would need to be made, such as children's education, housing, library, etc. Scientific staff rotation should take place for cross-fertilization of ideas and to bring research needs to headquarters, or vice versa.

(c) We strongly recommend that the majority of graduate level training be continued in foreign countries, in spite of the great cost differential, until such time as the graduate agriculture programmes within the country are upgraded. We hope the latter will receive high priority.

(d) We recommend more attention be given to the training of women scientists. This is thus far a virtually untapped scientific reservoir of talent.

(e) Promising students should be identified in secondary school or early in their college training, and special, competitive graduate

fellowships offered in agriculture, with supporting stipends for outstanding students at BAU and IPSA.

(f) BARC should not do teaching, but assess, coordinate and monitor training needs to meet NARP plans.

3.2.3.8 Bangladesh Agricultural University (BAU)

The Bangladesh Agricultural University was established in 1961 to provide, among other professionals, scientists capable of planning, managing and conducting the research needs of the agricultural sector. BAU has not yet achieved that level of excellence. Sending Bangladeshis to foreign universities is a stop-gap measure at best. Bangladesh must train its own. Nobody knows its needs better than the Bangladeshis.

Recommendations

(a) If BAU is to play an increasingly important role in training agricultural scientists, as we believe it must, then educational improvements and upgrading of staff and facilities merit high priority by the BDG and donors.

(b) A contract with a USA Title XII University should be considered. This should be a long-term project (10 years) for improvement of administration, teaching and research.

(c) We recommend high graduate school entrance requirements and competitive graduate fellowships, including adequate stipends and research support.

(d) Few BAU students have practical knowledge of agriculture when they graduate. The BAU Farming Systems Research and Development Programme could provide such training. A course in farming systems in which each student would attend lectures and then be responsible for designing questionnaires, going to village sites, interviewing farmers, summarizing the findings and suggesting interventions in term papers is strongly recommended. Soils majors might be responsible for mapping landforms, physical characteristics and fertilizer use and recommendations. Entomology majors might collect, identify, and determine life cycles of insects, evaluate their destructiveness and suggest economic controls. Animal science majors would concentrate on farm animal management problems and suggest interventions. These students should be supervised by the BAU farming systems staff. The logistics of providing transportation to the village would be a primary consideration.

3.2.4 Assessment of the Linkages between the Bangladeshi Research Institutions and the International Research Centers

The International Rice Research Institute (IRRI), the International Potato Center (CIP) and the International Maize and Wheat Center (CIMMYT) have been active in Bangladesh for years. They have been given

recognition for their cooperative research, which has led to impressive production increases in potatoes, wheat and rice.

The appeal of building linkages with the centers is that the benefits continue beyond the project period. They also have associated staff in commodity/discipline fields who may be contacted when needed. These include plant breeders, pathologists, entomologists, economists and manpower development experts. The commodity centers provide appropriate germplasm and excellent short-term and academic training programmes.

The USAID mission under ARP-I and ARP-II has supported IRRI's linkage with BRRI for rice research and vertebrate pest control research with the Denver Wildlife Research Center (DWRC). This support should continue under ARP-II-S. An on-farm water management specialist from IIMI funded by Ford Foundation divides his time between BARC, and the NARIs.

In order to forge new linkages, we recommend that funds be made available under ARP-II-S for assistance from the following centers:

1) An inland fisheries expert from ICLARM to be stationed at BFRI for 48 months.

2) An agricultural research management specialist from ISNAR to be officed at BARC for 48 months. This specialist should have extensive experience in programme planning at regional, national, or international center. ISNAR should also supply up to 48 person months of consultation in other areas of research management, as determined by BARC, USAID, and the ISNAR specialist.

3) Horticulturists from AVRDC to work with the BARI/OFRD on a long-term basis (48 months).

Participation of International Centers in Bangladesh Research

Name of IARC[1/]	Crop Discipline	Principal Cooperating NARI	Years of Cooperation
CIP[2/]	Potato	BARI	10
CIMMYT[2/]	Wheat	"	16
IRRI[3/]	Rice	BRRI	22
DWRC[3A/]	Pest Control	BARC	11
AVRDC	Vegetable Home Garden	BARI	Proposed
ISNAR	Research Mgt.	BARC	Proposed
ICLARM	Inland Fisheries On-Farm	BFRI	Proposed
IIMI[4/]	Water Management	BARC	Proposed

1/ Partial List

2/ Not funded by ARP-IIS

3/ Direct AID contract /3A PASA

4/ Funded by FF.

3.2.5 Impact to Date of Research Investments on Agriculture

3.2.5.1 Impact of research investments on productivity

Grain production increased at the annual rate of about two percent from the mid-1970's to 1985. Credit for these returns are shared among research, extension, water management and fertilizer supply. With any one of the three programmes stopped the total effort would be limited.

Since 1985, agricultural output has increased at a rate less than two percent (Annex F). The reason for the decline in rate of increase is not known. This should be researched.

Besides the return to the national economy from incremental production, harvesting it, from 1982 to 1985, for example, provided 166 million person days of employment for landless and land-shy people.

The depressed price of rice up to recently discouraged production investments, placing a bias against research. (At present, the price of rice is in line with inflation. However, if the recent PL-480 supplement in response to the flood results in an oversupply, the price will again be depressed. This will increase the farmer's hardship and put a further bias on research.)

The gestation period of most biological research is longer than the operational life of the project (LOP minus start-up time). ARP-II began its start-up in 1981 and the project ended in 1987.

3.2.5.2 Impact on household income

While the field teams introduced several component improvements to the farming systems they worked with, as a simple test, we looked at the effect of switching from a pre-project rice variety to Pajam in the Aman season. We applied the test to a composite or average household identified in a BRRI study in 1985 (Islam, BRRI, 1985). One FSR site team included the Pajam variety in their trials in 1985-86, and observed diffusion the next year (Annex C).

Without Pajam in Aman, the household produced 88 maunds* of paddy, paid 3 maunds for hired labor, bartered 12 maunds, retained 50 maunds for consumption and seed, sold 23 maunds at Tk. 175 and bought back 21 maunds at Tk. 190. This left Tk. 17, net disposable cash. With Pajam in Aman, the household gets an increase of eight maunds. They give four maunds for extra hired labor and add four maunds to the retained stock. They buy back 17 maunds, leaving Tk. 770, net disposable cash. Besides increasing the disposable income of this household, the intervention provided 28 days of additional employment for landless or land-shy people.

Switching to Pajam is a simple intervention as it requires only one input: seed of a self-pollinating species.

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* 1 maund = 37.32 kg.

Net disposable cash income to a composite or average farm with (a) all pre-project technology and with (b) a project-proven variety, Pajam for Aman

	Season			
	Aus	Aman	Boro	
Area in rice (ha.):	.36	1.08	.275	1.92 total
Average yield of paddy (maunds/ha.):	30.1	47.7	78.3	45.7 average
Production (maunds)	17	49	22	88
Production with Pajam for Aman	17	57	22	96

Item	Before Project	Pajam in Aman
Production (paddy)	88 maunds	96 maunds
Hired labor	3 maunds	7 maunds
Barter	12 maunds	12 maunds
Retained for seed and consumption	50 maunds	54 maunds
Sold	23 "@ 175=4007	23 maunds 4007
Bought back	21 "@ 190=3990	17 maunds 3230
Net disposable cash	Tk. 16	Tk. 770

Source: 1) Annex C

2) Aminul Islam, et.al. A Benchmark Study of Rice Marketing in Bangladesh. BRRI, May 22, 1985. Unpublished.

3.2.6 Advancement of the Status of Women

3.2.6.1 Background

Bangladesh is a Muslim society in which the roles of women are ranked inferior to those of men, severely so in rural social systems. The project provided the long-term services of 24 specialists to address every aspect of producing agricultural commodities -- rice, field crops, vegetables, soils, water, insects, vertebrate pests, plant diseases, farm machinery and production economics. All of these positions were filled by males. The project also provide approximately 300 person months of short-term, expatriate consultation, of which 30 months were allotted to anthropolocy. Twenty-two months' worth of expatriate anthropological consultancy was delivered, two by a woman. Twelve months were devoted to the study of women. (We were told that the present Executive Vice Chairman declined to approve the Member/Director's request for the remaining months of allotted consultancy.)

BARC retained a Bangladeshi consultant, a woman from Dhaka University, to work with the expatriate. They studied rural women's tasks.

In the meantime, the contractor's economics and social science specialist taught farm economic survey methods to mostly if not all males. In his course book, in an example of computing farm labour, he rated a day's labor by a woman as two-thirds that of a man.

It is generally accepted that Bangladeshi women grow the subsistance vegetables. Never mind marketing: the men take care of that. The contractor provided a vegetable production specialist, long-term. He was assigned to BARI. When he went away, he left no evidence of ever having been there.

Operating independently from the contractor, and BARC except for IDA contract funding, a BAU FSR site team, all males, discovered that women take care of poultry and at least some of the livestock. So they added two women livestock specialists to the team. Whether this was for the betterment of the role of women or for the betterment of the livestock was not clear. It was an encouraging start.

We see Mymensingh as the place where a model programme of assistance to women in agricultural and rural development can be built. There is a sufficient number of underemployed women at the University to form a critical mass of effort. All they need is a few simple resources, including transportation, and guidance.

3.2.6.2 Output

The consultants produced a description of women's work and roles in rural households. The findings were not incorporated in any of the symposia on training programs that we saw. There was no evidence of an awareness of women in farming systems in the contract research proposals we saw.

3.2.6.3 Appropriateness of plan and design

The Social Soundness Assessment of the Project Paper annexes called for "...policy-relevant data...concerning:

1) What women do, in the form of time inventories;

2) How they do it -- time budgets;

3) How they could do it more efficiently -- through improved methods and technology;

4) How they allocate their time between agriculture, family maintenance, expenditure, saving and/or income generating activities;

5) How their contributions are affected, positively and negatively, by technological and programmatic innovations;

6) How they participate in the family's agricultural decisions.

In order to generate this information, the research capacity of female social scientists must be supported and strengthened. In addition, more women must be trained in the social sciences and directed towards research concerning the activities of rural women. The information generated must flow then to policy makers and to extension staffs."

These things did not take place. We cited the one research report. No women were sent for foreign training in the social sciences. Only seven were sent for training anywhere.

3.2.6.4 General appraisal

It appeared to us that BARC elected not to include the role of women in its portfolio of objectives, and AID/Dhaka acquiesced, although insisting on at least token consultancies to placate AID/Washington. To repeat, although consultants are often needed to strengthen the specialist's programme, it is only the long-term specialist who can introduce and institutionalize a programme this complex, and only then with the full support of the host government.

3.2.6.5 Recommendations

(a) Critical mass and working model: We recommend that BARC negotiate a cooperative agreement with BAU to implement a research and teaching programme addressing, particularly, women in farming systems. BAU employs women in its FSR programme, which probably could be expanded to include non-credit instruction. The objective would be to develop a critical mass of professional skills addressing social systems analysis in general and the role of rural women in particular.

(b) Technical assistance: We recommend that AID post a long-term, contract specialist in rural social systems at Mymensingh to guide the development for the entire four years of the project. The person must be female. She must have up to 24 months additional, short-term assistance in training.

The person would be accredited to BARC and available for limited consultation to BARI. The BARC office in Dhaka is not an appropriate environment for the beginning of this work.

(c) In-country training: As procedures for working with women's problems in farming systems research are developed, they should be packaged in "cookbook" courses and taught to BAU women graduates who would be employed in the FSR program.

(d) Foreign training: As the Bangladeshi women working in the program prove themselves, they should be replaced and sent to the United States or the Philippines for training in rural sociology and anthropology. Some should be trained in horticulture, poultry husbandry and production economics.

The above recommendations are consistent with the Women in Development Implementation Plan for USAID/Bangladesh (Bergen and Grenley, July, 1987).

3.2.7 Assessment of the Role Played by the Technical Assistance Specialists in Facilitating Part or All of the Above

The project had ended and the contractor's field team had departed, except the chief of party and two specialists who had taken other jobs, when we arrived. Our impressions of the contractor's role in achieving the project outputs flowed from evidence of their work in these categories:

1) studies, manuals, surveys and reports:
   a) whether there were any produced;
   b) whether they were used;
   c) whether they made a difference in the project;

2) work initiated in the project;

3) Bangladeshi counterparts' valuations of the specialists' contributions.

These are our impressions of the contractor's contributions:

(a) Senior research management: The senior research management specialist was concurrently the manager of the contract. The latter chore took so much of his time that his contribution to research management was severely limited.

(b) Training: The contractor managed a large volume of training, both in-country and overseas. The training specialist's tour ended before his task was completed. The World Bank filled the position he vacated. The second person compiled the personnel data base (I D, above).

(c) Station management: Assistance in station management took place the second to fourth project years. The regional research stations appeared not well-managed at the time of the rapid rural appraisal (Annex C).

(d) Equipment maintenance: One institute, BARI, was effectively assisted in shop management and maintenance procedures. The specialist's lasting effectiveness was reduced by the failure of BARC to provide him a counterpart.

(e) Administration: The administrative specialists were not effective in assisting BARC with their accounting system.

(f) Commodity management: While the contractor purchased, received and delivered a large volume of commodities the contractor did not always follow through to see that the commodities were delivered to the proper places, installed and put into proper use. Some equipment was ordered for places not having adequate electricity to operate properly. The contractor left no record of the receivers and end users of the commodities.

(g) Land development: The land development specialist helped BARI level their research plot land, permitting them to get even distributions of water, hence reliable data from their plots.

(h) Farming systems research: The FSR sites were established the fifth year in the five-year project, extended two years. Much of the delay was due to philosophical debate on the nature of farming systems research, which the specialist could and no doubt did influence: they got the right answer. The delay was needed to provide at least minimal pre-service training to FSR site workers.

(i) Economics and social science: Finding that the people available for economics positions in the FSR programme had little or no research skills, the economics and social science specialist spent his tours teaching elementary survey methods and analysis. This enabled the FSR programme to start up. Since he did not train teachers, the training stopped when he left. No skills in rural social systems analysis were developed among FSR workers.

(j) Information, library and communications: The information specialist successful started the library and documentation programme at BARC. His tour ended before his work was completed.

(k) Production agronomy: The associate production agronomists uniformly received high marks for their contribution to the programme.

(l) Coarse grain research: Three composite varieties of maize were released by BARI in 1986. The specialist's role in the work is not known to us.

(m) Horticulture: We found no evidence of contributions by the horticulture specialist.

(n) Livestock research: The livestock specialist's outputs were limited by the fact that BLRI did not become operational before the end of his tour. One might ask what could he have done to advance livestock research under the circumstances. He wrote at least two papers that we saw. It would have been helpful if he could have developed dialogues among BARC, BLRI and the Ministry of Fisheries and Livestock.

(o) Soil fertility: The soil fertility specialist set up the BARI soils lab and trained the lab technicians. We questioned the feasibility of using the lab effectively to tailor fertilizer prescriptions to individual farms in Bangladesh.

(p) On-farm water management: The water management specialists received high marks for planning, teaching and field work. This activity also involved a large number of short-term consultants who generated over 130 major recommendations which so far have not been incorporated into the BARC programme.

(q) Entomology and plant pathology: These specialists were late arriving and left before the laboratories were set up. They had only limited outputs.

(r) On-farm storage: We saw or heard of no signs of this specialist's presence.

(s) Short-term consultants: The contractor provided a huge number of short-term consultants for jobs ranging from writing the pamphlet, This is BARC (one week), to Guy Baird's very useful work in research planning. The traffic they created must have been a burden both to the contractor and BARC management. From our enquiries, we judge that consultants in-country less than two months were not very effective. They write nice reports, but the shelves are already crowded.

3.3 ASSESSMENT OF THE FARMING SYSTEMS RESERACH PROGRAMME

3.3.1 Background

Given the many constraints of the Bangladeshi farmer's environment, the farming systems approach is appropriate for agricultural improvement.

The farming systems approach is designed to: (1) bring about technology transfers to small farmers via on-farm trials; (2) familiarize agricultural scientists with the many ecological, biological, physical

and socio-economic constraints on farmers' actions; and (3) encourage interdisciplinary research and linkages within and among research institutions. Simply put, the methodology involves integrating the art of the farmer that he has developed over many generations in his environment with recently developed, scientific technology with the goal of increased domestic food production, small farm income, and rural employment. Only recently has FSR evolved from cropping systems (CSR), so many comments pertain to CSR.

3.3.1.1 Appropriateness of the methods

The methods generally used in the ARP-II programme were those of the IRRI-Asian Farming Systems Network. There are six distinct phases: (1) site selection; (2) site description; (3) design of alternative farming practices; (4) testing of alternative component technology and cropping patterns; (5) pre-production testing and pilot production; and (6) production programme formulation and implementation. This method is used 13 countries of South and Southeast Asia, and is rapidly spreading to Africa.

A Bangladesh National Cropping Systems Committee (NCSC) was formed in 1980. This arose from cropping systems research begun by BRRI in 1974, and by other institutions in the late 1970's. In July 1985, the NCSC became the National Farming Systems Committee (NFSC) with seven institutions (BARI, BJRI, SRTI, LRI, BAU, BRRI, FRI) and BARC involved, and covered 23 farming systems sites. (Annex E).

Both the early cropping systems programme and farming systems programme were directly assisted and backstopped by four specialists. One was stationed at BARC, one at BARI headquarters, and three at BARI regional research stations. Approximately 279 months of technical assistance were devoted to this large programme.

The FSR team first did benchmark surveys and analyses of selected sites. Then they designed and implemented trials involving promising component technology and cropping patterns. Both BARI and BRRI teams have now moved to phase 4, or multi-location testing of the most promising systems. OFRD of BARI is involved in 11 different sites with 90 percent of their scientific staff stationed away from headquarters.

Recently, livestock specialists were seconded to BARI OFRD sites. BRRI has multi-location trials involving new rice cropping systems on five sites. Extension is now involved at early stages in both BARI and BRRI programmes and is expected to take the primary leadership in Phase 5, the pilot production stage. BAU also conducts FSR trials on two sites with multidisciplinary teams.

3.3.1.2 Outputs

The following achievements which hold hope for the future have evolved in recent years:

(a) The farming systems research approach is now familiar to and recently initiated by six institutes (BARI, BRRI, BAU, BJRI, SRTI, LRI) in key agro-ecological regions. Twenty-nine sites were established during ARP-II (Annex E). This is the largest FSR programme in the world.

(b) A memorandum of understanding now formalizes the linkage and involvement of DAE and BARI in FSR.

(c) A National Farming Systems Committee (NFSC) was established in 1985. ARP-II specialists served as members. A one week NFSC workshop for review and planning was held at BARC during our visit. BARC will publish the proceedings.

(d) Excellent training materials for FSR methods have been published by BARC and the various institutes.

(e) ARP-II specialists supported FSR regional and district workshops and conferences involving both research and extension personnel. An active role was maintained in the BARI on-farm trials by the project's three associate production agronomists stationed at the regional stations. Our rapid rural appraisal indicated that adoption of component technology was greatest in these trial areas (Annex C).

(f) FSR training took place at all levels--foreign and in-country graduate studies, short term study tours, workshops, and conferences sponsored by BARC, BARI and BRRI (Annex C).

(g) Our rapid rural appraisal indicated that farmers have accepted FSR component technology such as improved crop varieties and fertilizer use (Annex C). However, information on farmer acceptance of new cropping patterns or livestock components is scarce or non-existent. The exception is in the areas where HYVs of wheat replaced pulses and oil seeds.

(h) Farmers' field days were held at FSR sites by research and extension personnel. Good attendance indicated high interest.

(i) FSR research has recently made a start in integrating disciplines and research and extension personnel to plan common goals of improving the welfare of the farmer. Scientists from livestock, and horticulture are now involved with crop and soil scientists in implementing FSR programmes.

(j) The National Coordinated Farming Systems Research Programme, organized during ARP II, has attracted the attention of many donors. ARP II provided initial startup funds and much of the in-country training.

3.3.2 Appraisal/Constraints

The Bangladeshi farmer is at the subsistence level due to small farm size (0.9 ha) and annual income ($150) which allows for purchase of

few inputs and requires strong risk aversion. Thus the FSR concept of bottom-up research, starting with the farmer's environment and constraints is most appropriate. In reviewing the results available from cropping systems trials we noted the following constraints which will become more important as the programme encompasses livestock, home gardens, fisheries and other elements of the farmer's complex system.

(a) The changing of cropping systems to farming systems was slow in evolving. The way to best integrate livestock, fisheries and homestead garden improvements in farming systems remains challenging in Bangladesh, and worl-dwide. Additional training will be needed, particularly for site personnel and extension.

(b) Only limited socio-economic inputs were include in some early site surveys. Analyses of the performance of variables rarely included net returns, cost:benefit analisis, credit or market availability. More focus on input:output factors is needed.

(c) Minimum attention was devoted to vegetables, fruits and agroforestry, although in Bangladesh, fuel is becoming a serious problem.

(d) Women's roles in farming systems have not been adequately documented, neither has family nutritional benefits from changing technology.

(e) Information on soil types and fertility status is not uniformly or adequately documented on sites. Crop development phases, yields and seasonal weather data are not correlated.

(f) On-farm testing of new cropping patterns is often difficult due to damage caused by free-ranging animals. An unusual field attracts birds, animals and other pests, which masksor biases the relative performance of variables.

(g) Many new site team members are fresh graduates of BAU, having little practical agricultural experience. They require pre-service training and close supervision.

(h) Transportation to on-farm sites remains a serious problem.

(i) FSR site scientists feel that they are overlooked for training and advancements: "out of sight, out of mind".

(j) Several new crop varieties have only recently been accepted by the National Seed Board and made available for on-farm trials. These trials could accelerate acceptance of such varieties.

(k) At some sites the input levels seemed high for a small farmer subject to risk. This was especially true with fertilizer rates. Simple rate studies should be conducted in farmers' fields.

3.3.3 Summary of Findings

In summary, we respond to specific questions in our terms of reference:

3.3.3.1 Have appropriate farm technologies been developed in farmers' fields through the national FSR programme?

Technically, for FSR, the answer is No, because FSR sites were not established until 1985 and did not become effectively operational until 1987. Only limited FSR in livestock interventions has started. It takes considerable time to note spread or impact from these efforts. We expect interventions in vegetable gardening to move faster.

The answer for the cropping systems research sites operated during the project is Yes. Both BARI and BRRI have conducted surveys which revealed that new varieties and fertilizer use spread from their CSR sites. One estimate is that BR-II is grown on 40 percent of the land during T. Aman. BRRI scientists first noted the potential of the early BR-3 and BR-II varieties to increase the intensity of cropping in a given area. This enabled the growing of two crops rather than one or three crops rather than two when a new, early maturing variety of mustard or fast growing vegetables was grown after the early maturing T. Aman rice. (Obviously, this increase in cropping intensity has not yet shown up in Bangladesh Bureau of Statistics.)

Forty-three percent of the rice production is now from HYV and the figure has steadily increased. How much of this acceptance was due to CSR research is not known. The CSR researchers did verify that the new varieties grew well under farmers' constraints. In other cases the farmers' evaluations of varieties and cropping systems were referred back to the breeders and agronomists at headquarters and incorporated in their research. The CSR involved the local Upazila (county) and block extension agents in the on-farm trials, making their information was timely and adapted to their area.

3.3.3.2 Are the research institutes effectively coordinating and cooperating at single farming systems sites and are they effectively conducting farming systems research? Are there administrative bottlenecks in doing so?

3.3.3.2.1 Interagency coordination

Up to the end of the project, each participating institute implemented, first it cropping systems programme and then farming systems research with its own complement of scientists. Near the end of the project the Livestock Research Institute hired, trained and seconded personnel to BARI, BRRI and BJRI at their FSR sites.

3.3.3.2.2 Administrative bottlenecks

The institutes have not yet adopted effective procedures for implementing interagency research projects. For example, the BLRI director has encountered difficulties in communicating with the BLRI personnel assigned to FSR projects implemented by other institutes.

3.3.3.2.3 Actions to overcome administrative bottlenecks

Interagency cooperation is a new concept in Bangladesh agricultural research. It is a major justification for BARC. It can be accomplished by joint planning wherein responsibilities are accepted for specialized effort and geographic location -- that is, core discipline and research site. For example, BRRI should coordinate all rice research and should supervise all rice research except that done by BAU, which has academic license to participate in all areas. At the same time, BRRI controls certain FSR sites. This example is applicable to BARI, BJRI and BLRI. We can show by matrix that, for example, all of the livestock research performed at all of the research stations and all of the FSR sites make up the national livestock research programme. That, plus the FSR sites it operates, make up the total BLRI programme.

Example of a Cooperative Research Program

Commodity/ Discipline	Agency	Location: Station A	B	C	D	E	F	G	FSR Sites A	B	C	Total
Rice	BRRI	X							X	X	X	XXXX
Jute	BJRI		X						X	X	X	XXXX
Sugarcane	SRTI			X					X	X	X	XXXX
Other Crops	BARI				X				X	X	X	XXXX
Livestock	BLRI					X			X	X	X	XXXX
Fisheries	NIFR						X		X	X	X	XXXX
Forestry	FRI							X	X	X	X	XXXX

National research program = 7 x (XXXX)

The programme would be the product of joint planning. The coordinator of FSR sites would request personnel from the several appropriate institutes. At that point, for example, the livestock research at the requestor's site becomes an item in the BLRI programme, which BLRI should supervise. The principal officer at the FSR site coordinates the livestock work with the other activities. Coordination is the key word.

3.3.3.3 Are the agricultural research institutes increasing their capacity to conduct relevant research at the FSR sites and to facilitate the delivery of research results to extension personnel and farmers?

3.3.3.3.1 Capacity to do relevant research at the FSR sites

As late as 1985, there were no FSR sites in Bangladesh. Establishing 29 is evidence of increased capacity. They follow accepted FSR methods. Although in many cases their design and analytical skills are weak, they show evidence of improving. They do not receive adequate technical support from their institute headquarters.

3.3.3.3.2 Delivering research results to extension personnel and farmers

(1) Field days: We found that the seasonal field day is a part of most FSR site programmes. The extension agents have teaching roles as well as learning roles at those meetings (Annex C).

(2) Joint planning: Whether there is much joint planning by the research and extension agencies is not clear. We did notice that RARS personnel and counterpart, extension personnel exchanged visits at their respective review and planning sessions. The directors of most of the research and extension agencies sit in eachother's annual review sessions (Annex C).

(3) Training: BRRI has an effective, IRRI-type training programme for extension workers. NFRI has plans for such a programme. We did not learn of such programmes at the other institutes.

(4) Publications: The established institutes publish annual reports in small numbers and send them to the extension services, the departments of the pertinent ministries, the agricultural education institutions and BARC. BARC publishes its annual Bibliography of Agriculture. We found a shortage of all publications.

3.3.3.3.3 General appraisal recommendations:

(1) Field level publications: The FSR site teams should print (mimeograph) progress reports and fact sheets to give out at their field days. There is sufficient literacy in the rural population to get good use of printed messages. Printed matter goes a long way toward keeping a message moving while preserving its validity.

(2) Institute level publications: The annual reports of the established institutes are useful. However, single project reports could be extremely helpful to extension workers, professors and students.

3.3.3.4 What impact has ARP-II had on the national Farming Systems Research Programme?

3.3.3.4.1 Appraisal

The project has almost completely reoriented Bangladesh agricultural research toward farming systems research. This was accomplished by dedicating a tremendous effort to the movement and by supporting it with contract and PL-480 generated funds. The AID project has not only influenced the Bangladesh institutes but also the donors who support them.

There are more FSR sites than can be properly supported and managed.

3.3.3.4.2 Actions to address the present constraints/weakness:

(1) Design for generalization: Implement one FSR site in each major agro-ecological zone. Make standard soil analyses of the site. The results obtained at each site can be generalized throughout the agroecological zone, thus requiring fewer field sites.

(2) Technical assistance: The institute should provide more on-site and near-site training and technical backstopping for FSR site workers. If the institute can't provide the training required, BARC should be called upon to set up a procedure for securing contract training courses.

3.3.3.5 What can be done during the implementation of the ARP-II-S to improve the capability of FSR?

The success of FSR will depend on the success of integrating the scientists from livestock, fisheries, and forestry the crops disciplines. Training of such staff will be paramount. Lines of communication and command must be clearly understood. We suggest a review of methods with the view of reducing complexity and the present, lengthy time frame. We say this because of the need to look at cost reductions. Perhaps quick surveys with less information and greater emphasis on component technology, rather than cropping patterns, should have priority. The latter results are erratic because of seasonal weather fluctuations and destruction by animals and pests. Perhaps too much time is spent in analyzing the farmer and planning trials and not enough action in spreading new technology over a larger target area (we do support on-farm trials).

The programme would benefit in the long run by reducing the number of sites of each regional station, each of which is set in a major agro-ecological zone. BJRI and BLRI would each continue one site. BAU would continue with its two sites. Emphasis would be placed on generating technology that can be reliably generalized.

3.3.4 Recommendations

(a) The National Farming Systems Coordinating Committee should carefully evaluate future training needs as well as methods to more actively involve scientists from horticulture, livestock, fisheries, and forestry and the supporting disciplines of agricultural economics, rural sociology, entomology and plant pathology. Close cooperation and participation in planning, implementing and interpreting experiments will be needed.

(b) Incentives, recognition, promotion, training and awards must be as great for the scientists participating on FSR interdisciplinary teams, as for those conducting research at headquarters.

(c) Farming systems scientists stationed at headquarters need access to vehicles to visit sites and participate in workshops and field days to offer encouragement and technical advice and to receive feedback from local scientists and farmers.

(d) Local and regional extension staff must be trained in FSR concepts and become actively involved in the planning and evaluation of trials in their respective areas.

(e) Information from all farming systems trials should include detailed records of climate, soil and crop development, as well as the input variables. These data will allow for better interpretation of trial results. Computerization will facilitate the assimilation of such data bases, and the models evolved might reduce the number of field trials needed or years required to adequately assess risk and/or potential. Because of the great climatic variation between seasons and the ecological differences within small areas and even within a farmer's holdings, technology proof and transfer will be a continuing challenge. All known methods must be brought to bear on it.

(f) While the farming systems research approach has many advantages, policy makers must continue to support applied research at the institutes. From such research will come agricultural improvements of the future. A challenge to policy makers will be to keep a balance between FSR and station research programmes and facilitate close linkages between the two.

(g) The time may be approaching to consider a journal or newsletter to publish farming systems research findings, or this might be considered by the recently resurrected Bangladesh Society of Agronomy.

(h) There is a need for on-site monitoring of changes in family diet, income disposal, and quality of life.

(i) Methods of getting benchmark, base-line information in less time and space should be developed.

(j) The site responsibilities as agreed upon in the memorandum of understanding between DAE and BARI should be followed.

(k) The method, timeframe and cost of monitoring the success of farming systems research should be agreed upon and budgeted for. When failures occur the reason should be well documented and available to all scientists involved in planning the programmes.

(l) The annual FSR review and planning workshop involving all concerned institutes, held at BARC, should be continued.

(m) However, the present FSR Task Force should not be directly under BARC. We suggest the chairman and convenor be the BARI OFRD Head, due to the extensive OFR trials the institute conducts.

(n) The number of FSR sites should be reduced to eight. With six corresponding to institute field research centers and two operated by BAU.

SECTION 4. RECOMMENDATIONS FOR IMPLEMENTING THE PROJECT SUPPLEMENT

4.1 PURSUIT OF PURPOSE

4.1.1 Roles and Division of Labor

Each of the several institutes, except BINA, was ordinanced to conduct applied research in one or more specific commodity areas: BRRI, rice; BJRI, jute; FRI, Forestry; BTRI, Tea; SRTI, sugarcane; BARI, all other crops; BLRI, livestock and poultry, and NIFR, fisheries). BINA's purpose is to make beneficial applications of atomic energy to agriculture. Under its ordinance, BAU can conduct research in all areas except perhaps nuclear agriculture. BARC's mandate is to coordinate and monitor all of the research conducted by all of those institutions.

Cropping systems research required crossing institute lines. To do cropping systems research, BARI must have access to the skills found at BRRI, and vice versa. Methods have become matters of major consideration. With farming systems research, the skills of all institutes except BINA may be needed at any research site. Since BARI possesses the greatest range of skills it should be elected to assume the lead in implementing the national FSR programme. BRRI would keep its overall responsibility for rice research, which would include participating in all FSR sites which include rice as a component. And so on with the other institutes.

BAU should continue to internally coordinate its FSR programme, as it has a complete complement of scientists.

BARC's role is to coordinate the programme of the several institutes in pursuit of national goals, as in leading the development of the national agricultural research plan and in supporting the institutes in implementing the plan.

4.1.2 Guidance by Plan and Review

The procedure would be simple:

1) The Director Generals, with BARC chairing, would coordinate their work plans.

2) BARC would provide services and supplemental funds to implement the plans.

3) The Director Generals, with BARC chairing would periodically review their work against their plans.

4.2 TECHNICAL ASSISTANCE

4.2.1 Assignments

The technical advisors should be posted at the points of greatest access to their clients. Those who assist BARC with institutional development and in providing services to the research institutions should be assigned to BARC. Those who are to assist in biological research should be assigned to the institutes of appropriate interest. We recommend the following assignments:

1. Senior Research Systems Management Specialist
   a. Source: Host country contract
   b. Assignment: BARC
   c. Counterpart: Executive Vice Chairman

2. Planning and Monitoring Specialist
   a. Source: ISNAR
   b. Assignment: BARC
   c. Counterpart: Member/Director for Planning and Evaluation

3. Communications Specialist:
   a. Source: Host country contract
   b. Assignment: BARC
   c. Counterpart: Director of communications and publications

4. Human Resources Development Specialist:
   a. Source: Host country contract
   b. Assignment: BARC
   c. Counterpart: Director of manpower training.

5. Research Facilities/Support Services Specialist:
   a. Source: Host country contract
   b. Assignment: BARC
   c. Counterpart: Chief, Research Facilities/Support Services cell

6. Research Administration Specialist (Rice):
   a. Source: IRRI
   b. Assignment: BRRI
   c. Counterpart: Director General, BRRI

7. Farming Systems Research Specialist
   a. Source:IRRI
   b. Assignment: BRRI
   c. Counterpart: PSO, FSR Division

8. Farming Systems Research Specialist:
   a. Source: Host country contract
   b. Assignment: BARI
   c. Counterpart: On-Farm Research Division

9. Horticulture Specialists (including short-term assistance)
   a. Source: AVRDC
   b. Assignment: BARI
   c. Counterpart: Senior horticulturist; accessible to cooperating institutes/On Farm Research Division

10. Livestock Specialist:
   a. Source: Host country contract
   b. Assignment: BLRI
   c. Counterpart: Director, BLRI; accessible to cooperating institutes

11. Aquaculture Specialist:
   a. Source: ICLARM
   b. Assignment: NIFR
   c. Counterpart: Director, NIFR; accessible to cooperating institutions

12. Integrated Pest Management Specialist:
   a. Source: Host country contract
   b. Assignment: BARI
   c. Counterpart: Director of the Plant Protection Division

13. Vertebrate Pest Management Specialist:
   a. Source: DWRC (PASA)
   b. Assignment: BARI
   c. Counterpart: PSO, Vertebrate Pest Management Division

14. Water Management Specialist (Short-term consultants)
   a. Source: Host Country Contract
   b. Assignment: BARC
   c. Counterpart: Director of Irrigation Engineering

15. Economist/Social Science Specialist:
   a. Source: Host country contract
   b. Assignment: BARC/BARI
   c. Counterpart: Member/Director, BARC, accessible to cooperating institutions.

16. Rural Social Systems Specialists:
   a. Source: To be determined
   b. Assignment: BARC/BARI
   c. Counterparts: BARI and BAU officers.

The last specialist would concentrate her efforts on developing rural social systems research models and training, first in the Mymensingh area. There is an on-going FSR programme that has the potential of developing into a comprehensive, hands-on-training facility. There are impressive skills in the area. There is sufficient number of women graduates at or near the University, around which to build a socio-economic assistance programme for women.

4.2.2 Engagement of the International Centers

4.2.2.1 Policy

Each international center is without a peer as a resource base for its speciality. They establish lasting relationships with client countries and institutions, which is needed in Bangladesh. To the extent that they can respond, the centers should be the first choice of sources of technical assistance, the first choice for foreign training and the first choice for assistance in in-country training. They design their courses to fulfill the needs of the developing countries. Training at or by the centers develops strong linkages between them and the trainees. We recommend engaging them to provide technical assistance, training and genetic material to the maximum extent that they can deliver.

4.2.2.2 Mode of engagement

AID should underwrite agreements between the centers and the Bangladeshi institutes. The main reason for the direct engagement is to enhance the relationship between the host country and the centers. AID should anticipate the need to underwrite these engagements long after the expiration of this Project Supplement.

4.2.2.3 Understanding with the Centers

Technically, the Centers' policies require them to deal directly with client governments. However, in cases of earmarked commitments such as this, a memorandum of understanding is usually prepared between the center to the host government.

AID should be assured by the participating centers that they understand the project and intend to cooperate in pursuit of its objectives. We refer specifically to overseas training grants, dispatching consultants, forward planning and reporting. Although the centers' field agents will not report to AID, they should be aware that AID will require copies of their quarterly reports and forward work plans.

4.2.3 The Host Country Contractor

4.2.3.1 Responsibilities

A technical assistance contractor will be retained to:

(a) provide the technical assistance proposed by the project, except that contracted directly by AID;

(b) manage external training, including placement, logistics, payment of tuition and stipends, response to critical needs, monitoring progress and assistance in re-entry to the Bangladesh work force;

(c) with counterpart assistance, plan and prepare specifications for importation of commodities;

(d) purchasing and forwarding the commodities;

(e) customs-clearing, receiving and delivering commodities;

(f) providing assistance in the assembly, installation and use of the commodities;

(g) providing technical and managerial consultation and formal and on-the-job training at all levels of project implementation;

(h) designing work plans and reporting progress.

4.2.3.2 Relations

(a) Chief of Party: As the contractor's representative and senior specialist to the project, the chief of party relates to the senior officer of BARC. He also relates to the AID/Dhaka Mission through the designated Project Officer, who has the delegated responsibility for monitoring the project.

(b) Contractor's personnel: The contractor's personnel should be paired with Bangladeshi counterparts (A, above). In addition, they should be at liberty to relate informally with the AID Project Officer.

(c) Policy on short-term consultants: Engagement of short-term consultants should be shown and justified in the project work plans (V.C, below). (The 1987 External Evaluation of ARP-II indicated that consultants retained for less than two months were ineffective.)

4.2.4 Utilization of National and Regional Expertise

The Project should use national and regional contract services to the maximum extent of availability. Such expertise, necessary for national development, is available for further employment after projects end.

4.3 COMMODITY PROCUREMENT AND MANAGEMENT

This general procedure should be followed in U.S. and third country procurement:

(a) Plan: BARC and the contractors should jointly draft a life-of-project, commodity procurement plan.

(b) Purchasing and forwarding: The contractor should purchase from

the U.S. General Services Administration Schedule or from the lowest bidder. The contractor should forward the goods and notify its Dhaka team of the carrier and date of arrival.

(c) Clearing and receiving: The contractor (preferably through a Dhaka sub-contractor) promptly gains release of the shipment.

(d) Inspection and delivery: The contractor inspects the shipment and delivers it to the intended users.

(e) Follow-up: The contractor provides the appropriate technical assistance to the users in assembling, installing, operating and maintaining the commodities.

4.4 TRAINING

4.4.1 Human Resources Development Plan

BARC has a human resources requirements data base, stated in academic levels and professional disciplines. This should be expanded into a detailed statement of required skills by research unit and location over time.

4.4.2 Foreign Training

(a) Selection: BARC should use Dorsey Davies' Selection Criteria in selecting participants for foreign training. AID/BARC should follow the approval system they used in ARP-II.

(b) Placement and support: The contractor's home office would place the participants, pay for tuition and support and monitor their progress.

(c) Re-entry: The contractor should advise and assist BARC or the employing institute in placing the returning participants in the positions for which they were trained. The contractor should help the returnees get started in their jobs and in using their new skills.

4.4.3 In-Country Training

(a) Scheduling: The training directors of the cooperating institutes, with BARC's assistance, should schedule the required skills courses and related exercises(workshops, symposia, etc.) over the life of the project.

(b) Arrangements: The same group would arrange with cooperating institutions for facilities and teachers to offer the courses.

(c) Catalogue: BARC would publish a catalogue of the courses by place, time and terms of participation.

(d) Preparation: The contractor and the participating centers would assist the teachers in drafting the syllabi and in preparing to teach the courses.

(e) Participation: The institutes would have first priority for training positions. They would select their personel on the basis of need for job related skills, conforming with the Manpower Development Plan.

(f) Follow-up: The institutes' supervisors, the contractor and the centers, would assist the participants in using their new skills.

4.4.4 Aiding Professional Growth

The contractor and the Centers should plan and implement specific programme to keep the skills of the personnel current and to assist the personnel in professional growth. The programme should include the following:

(a) Current literature: Current, professional journals and related literature should be available to all professional workers.

(b) On-the-job training: The contractor and the Centers should conduct structured, professional development programme for their counterparts (recommended reading, discussion groups, progress reports).

4.5 PROJECT IMPLEMENTATION

4.5.1 Control

The senior executive of BARC is the controlling officer of the Project.

4.5.2 Consultation and Issues Management

The Executive Vice-Chairman of BARC should consult the chief of the contractor's party and the AID Project Officer regularly and frequently to update project activities and resolve issues. Although the Chief of Party and the AID Project Officer will each have business with the Executive Vice Chairman which does not concern the other, they both should participate in the meetings described here. The time and dates should be set as far in advance as feasible. The procedure should be informal.

4.5.3 Implementation by Plan and Review

4.5.3.1 Life-of-project plan

Within the first six months of the Project Supplement, BARC and

the participating institutes should lay out their major activities by quarter, for the life of the project. The constraints would be compliance with the combined Master Plan and the provisions of the Project Paper.

4.5.3.2 Annual work and financial plan

We recommend continuing the Annual Work and Financial Plan and including quarterly time dimensions.

4.5.3.3 Reporting

We recommend that all implementing entities submit progress reports keyed to their work plans the month following the close of each quarter.

4.5.3.4 Project review

The progress in implementation would be reviewed "up" the chain of responsibility. The supervisor at each "command" level would review the reports he or she gets, resolve the constraints and issues resolvable at that level and pass the unresolvable issues "upward". Finally, the institute directors and the Executive Vice Chairman of BARC would manage the remaining constraints and issues. He would be assisted by the contractor's Chief of Party and the Project Officer as appropriate.

4.5.3.5 End-of-project report

The contractor and the participating centers should submit final reports relating inputs, outputs, unfinished work and constraints.

4.6 CONTRACT AND PL-480 FUNDED RESEARCH

4.6.1 Research Proposals

The research projects proposed for contract or PL-480 funding should be distinct elements of the project plan. They should be approved and managed by the implementing institutions. BARC should establish general criteria, which would be reflected in the project plan. BARC would have a general monitoring and review function.

(Financial management of contract and PL-480 funded activities is under consideration by the AID Mission).

4.7 MONITORING

4.7.1 Responsibilities

The monitoring responsibilities of the AID Project Officer are

stated in AID Handbook 3. We have suggested a style of implementation monitoring above.

4.7.2 The Work Load

As proposed here, the Project Officer would manage four international centers, a PASA and a host country contractor for life-of-project inputs. He will also manage two or more evaluation contracts. The work will be interrupted, probably by two rest and recuperation leaves, a home leave and one or two changes in personnel. The Mission should analyze the workload of monitoring the project to determine whether it requires more than one person.

4.8 EVALUATION

4.8.1 Information Needed

Except for numbers of scientists, the Log-Frame calls for non-quantitative evidence of project outputs. This should be kept in mind in implementing and evaluating the project, as there is a tendency in AID to read quantity into outputs at evaluation time.

4.8.2 Methods

4.8.2.1 To monitor early and progressive signs of end outputs (useful farm technology)

Early signs of useful, technical outputs may be observed by stratified, baseline and follow-up surveys. New technology can be traced to its source through linkage analysis. Blockages in information channels may be revealed the same way. Extrinsic constraints to the spread of technology may be identified by economic and social systems analysis.

4.8.2.2 To monitor institutional progress

We recommend a mid-term, external evaluation and one at the end of the project. Both evaluations should be performed by the same team.

4.8.3 Procedures

4.8.3.1 Evaluation design

AID should design a life-of-project evaluation plan. It should:

a) state the scope of the enquiry (focal questions);

b) describe the data required;

c) prescribe methods and procedures;

d) prescribe locations and dates of enquiry.

4.8.3.2 Implementation

(a) Field data: Field data should be taken the first, seventh and fourteenth quarters.

(b) Evaluation: The external evaluation would be made the eighth and fifteenth quarters.

A N N E X A

TERMS OF REFERENCE

AGRICULTURAL RESEARCH II PROJECT
(388-0051)
1987 EXTERNAL EVALUATION
STATEMENT OF WORK

PURPOSE: THE MAIN PURPOSES OF THE EVALUATION ARE TO: ASSESS THE OVERALL IMPACT OF THE AGRICULTURAL RESEARCH PHASE II PROJECT IN BANGLADESH AND TO MAKE RECOMMENDATIONS FOR AN IMPLEMENTATION PLAN FOR THE ARP-II SUPPLEMENT.

USERS OF THE EVALUATION FINDINGS AND RECOMMENDATIONS ARE THE DECISION-MAKERS WHO WILL DESIGN AND APPROVE THE IMPLEMENTATION PLAN FOR THE ARP-II SUPPLEMENT. THESE ARE: THE EXECUTIVE VICE CHAIRMAN OF THE BANGLADESH AGRICULTURAL RESEARCH COUNCIL (BARC), THE MEMBER-DIRECTORS OF BARC, THE USAID PROJECT AND PROGRAM OFFICERS AND SENIOR MANAGEMENT STAFF, AND SENIOR OFFICIALS OF THE BANGLADESH MINISTRY OF AGRICULTURE AND MINISTRY OF LIVESTOCK AND FISHERIES. IN ADDITION, THE EXTERNAL EVALUATION WILL BE USED FOR GUIDANCE DURING IMPLEMENTATION OF THE ARP-II SUPPLEMENT BY THE TECHNICAL ASSISTANCE TEAM, MEMBER INSTITUTIONS OF THE NATIONAL AGRICULTURAL RESEARCH SYSTEM (NARS), AND THE USAID PROJECT AND PROGRAM OFFICERS.

BACKGROUND:

WITH THE GOAL OF INCREASING DOMESTIC FOOD PRODUCTION, SMALL FARM INCOME, AND RURAL EMPLOYMENT, THE PURPOSE OF THE AGRICULTURAL RESEARCH PHASE II PROJECT (ARP-II) IS TO STRENGTHEN THE CAPACITY OF THE NATIONAL

AGRICULTURAL RESEARCH SYSTEM TO DEVELOP APPROPRIATE TECHNOLOGIES FOR FARMERS THROUGH IMPROVED PLANNING, INTEGRATION, ALLOCATION, AND UTILIZATION OF RESOURCES. THE $27 MILLION, SIX-YEAR PROJECT IS DESIGNED TO INTEGRATE RESEARCH PROGRAMS ACROSS MINISTERIAL AND INSTITUTIONAL LINES TO GENERATE APPROPRIATE SMALL FARMER TECHNOLOGIES. THE ACTUAL TRANSFER OF THOSE TECHNOLOGIES TO THE FARMERS ON A NATIONAL SCALE IS THE BASIS OF A SEPARATE WORLD BANK PROJECT. ARP-II, WHICH BEGAN IN 1981 AND WAS AMENDED IN 1982, PROVIDES TECHNICAL ASSISTANCE, TRAINING, AND COMMODITIES FOCUSED ON IMPROVING THREE AREAS OF THE BANGLADESH NATIONAL AGRICULTURAL RESEARCH SYSTEM:

- STRENGTHENING THE MANAGEMENT AND SUPPORT CAPABILITIES OF THE BANGLADESH AGRICULTURAL RESEARCH COUNCIL (BARC), THE BODY CHARGED WITH ENCOURAGING AND COORDINATING AGRICULTURAL RESEARCH IN BANGLADESH.
- IMPROVEMENT OF RESEARCH PROGRAMS IN SIX CORE DISCIPLINARY AREAS.
- DEVELOPMENT OF A NATIONAL FARMING SYSTEM RESEARCH PROGRAM.

BARC'S MANAGEMENT OF AND SERVICES TO THE NARS ARE EXPECTED TO INSURE THAT ALL NEEDED AGRICULTURAL RESEARCH IS CARRIED OUT AND THAT THIS RESEARCH IS ACCOMPLISHED AS EFFICIENTLY AND EFFECTIVELY AS POSSIBLE. BARC'S ACTIVITIES INCLUDE: (1) TRAINING RESEARCH PERSONNEL, (2) COMMUNICATING AND STORING RESEARCH INFORMATION, (3) ALLOCATING RESEARCH RESOURCES, (4) IDENTIFYING, PLANNING, PRIORITIZING, INTEGRATING, MONITORING, AND EVALUATING NATIONAL RESEARCH PROGRAMS, AND (5) ASSISTING RESEARCH INSTITUTES WITH RESEARCH FACILITIES MANAGEMENT, COMMODITY PROCUREMENT,

AND MAINTENANCE OF FACILITIES AND COMMODITIES. THE PROJECT IS DESIGNED TO DEVELOP USEFUL DISCIPLINARY RESEARCH AND DISSEMINATE FINDINGS IN: ECONOMICS AND SOCIAL SCIENCE, CROP RESEARCH, LIVESTOCK AND FISHERIES RESEARCH, SOIL MANAGEMENT, WATER MANAGEMENT AND PEST MANAGEMENT.

THE FARMING SYSTEM RESEARCH (FSR) SITES SCATTERED AROUND THE COUNTRY ARE MEETING GROUNDS FOR RESEARCHERS, EXTENSION WORKERS, AND FARMERS. IMPROVED FARMER TECHNOLOGIES AND CROPPING PATTERNS GENERATED AT RESEARCH STATIONS ARE TESTED AT MULTI-LOCATION TEST SITES IN FARMERS' FIELDS WITH FARMERS' PARTICIPATION. ALSO, INNOVATIVE CULTURAL PRACTICES FROM THE LOCAL AREA ARE TESTED FOR POSSIBLE WIDER FARMER ADOPTION. THESE SITES ALSO PROVIDE AN OPPORTUNITY FOR BANGLADESH'S AGRICULTURAL RESEARCH INSTITUTES TO INTEGRATE THEIR EFFORTS AND POOL RESOURCES TO DEVELOP COMPONENTS OF PRODUCTIVE FARMING SYSTEMS ADAPTED TO LOCAL AREA CONDITIONS.

THE ARP-II HAS BEEN IMPLEMENTED BY THREE TECHNICAL ASSISTANCE CONTRACT TEAMS CONSISTING OF LONG TERM AND SHORT TERM CONSULTANTS. HOST COUNTRY CONTRACTS WERE SIGNED WITH BARC, THE BANGLADESH RICE RESEARCH INSTITUTE (BRRI) AND THE BANGLADESH AGRICULTURAL RESEARCH INSTITUTE (BARI). THE TEAMS HAVE BEEN HEADQUARTERED AT BARC, BRRI, AND BARI BUT WITH TEAM MEMBERS WORKING WITH SEVERAL UNITS OF THE RESEARCH SYSTEM: BARC, THE RESEARCH INSTITUTES, THE REGIONAL AGRICULTURAL RESEARCH STATIONS, AND LOCAL FARMING SYSTEMS RESEARCH SITES OVER THE LIFE OF THE PROJECT (LOP),

THERE HAVE BEEN THREE INTERNAL EVALUATIONS AND TWO EXTERNAL EVALUATIONS. THE LAST EXTERNAL EVALUATION (MAY, 1985) WAS USED AS THE BASIS TO DESIGN AND NEGOTIATE A FOUR YEAR SUPPLEMENT TO THE ARP-II PROJECT. THIS EXTERNAL EVALUATION WILL ASSESS AND ANALYZE THE OVERALL IMPACT OF THE PROJECT AND RECOMMEND AN IMPLEMENTATION PLAN BASED ON "LESSONS LEARNED" FOR THE IMPLEMENTATION OF THE ARP-II SUPPLEMENT.

EVALUATION STRUCTURE:

THE EVALUATION IS FOCUSED ON THE FOLLOWING KEY MANAGEMENT QUESTIONS:

1. A. HAS BARC GROWN AS AN INSTITUTION OVER THE PAST 10 YEARS AND TO WHAT DEGREE IS IT HAVING AN IMPACT ON THE NATIONAL AGRICULTURAL RESEARCH SYSTEM?

   B. GIVEN THE CURRENT INSTITUTIONAL, ECONOMIC, POLICY, AND OTHER CONDITIONS IN BANGLADESH, HOW MIGHT BARC BE CHANGED SO IT CAN MORE EFFECTIVELY FULFILL ITS FUNCTIONS FOR THE NATIONAL AGRICULTURAL RESEARCH SYSTEM? WHAT ARE THE KEY VARIABLES, BOTH INTERNAL AND EXTERNAL, THAT AFFECT BARC'S ABILITY TO INFLUENCE THE NARS? FOR EXAMPLE, DOES INADEQUATE INTERNAL MANAGEMENT INHIBIT BARC'S ROLE? ARE ENDOGENOUS FACTORS INVOLVED, E.G.,

INADEQUATE BDG UNDERSTANDING OF BARC'S POTENTIAL ROLE IN THE NARS, INADEQUATE MANDATE AND INSTITUTIONAL AUTONOMY TO FULFILL ITS' RESPONSIBILITIES?

C. HOW CAN THE ARP-II SUPPLEMENT STRENGTHEN BARC?

2. A. HAVE TECHNOLOGIES RELEVANT TO FARMER NEEDS BEEN GENERATED BY THE RESEARCH PROCESS SUPPORTED BY ARP-II IN THE SIX CORE DISCIPLINES?

B. WHAT CAN BE DONE DURING THE IMPLEMENTATION OF THE ARP-II SUPPLEMENT TO IMPROVE THE PRODUCTION OF FARMER-RELEVANT TECHNOLOGIES IN THE RESEARCH SYSTEM?

3. A. TO WHAT EXTENT HAVE IMPROVED TECHNOLOGIES PRODUCED UNDER A RESEARCH PROCESS SUPPORTED BY ARP-II BEEN ADOPTED BY BANGLADESHI FARMERS?

B. HAVE YIELDS, PRODUCTION OR FARM INCOME INCREASED AS A RESULT OF THIS PROJECT?

C. WHAT CAN BE DONE DURING THE IMPLEMENTATION OF THE ARP-II SUPPLEMENT TO IMPROVE THE CAPABILITY OF THE NATIONAL AGRICULTURAL RESEARCH SYSTEM TO TRANSFER IMPROVED TECHNOLOGIES TO EXTENSION WORKERS AND TO FARMERS?

4. CAN THE FARMING SYSTEMS RESEARCH PROGRAM EFFECTIVELY OPERATE IN BANGLADESH, AND WHAT WILL IT TAKE TO MAKE THIS PROGRAM WORK?

IN ADDITION, THE BANGLADESH MINISTRY OF AGRICULTURE MOA) AND USAID ARE INTERESTED IN THIS EVALUATION TEAM(S) IDEAS ABOUT AN APPROPRIATE SCOPE OF WORK FOR A PROPOSED BROAD BASED ASSESSMENT OF THE TOTAL AGRICULTURAL RESEARCH SYSTEM IN BANGLADESH.

TO ADDRESS THESE QUESTIONS, THE EVALUATION WILL BE DIVIDED INTO FIVE PARTS:

- ASSESSMENT OF BARC'S COORDINATION OF AND SUPPORT SERVICES TO THE NATIONAL AGRICULTURAL RESEARCH SYSTEM (I.E., RESEARCH SYSTEMS MANAGEMENT, TECHNICAL SUPPORT, MANPOWER DEVELOPMENT AND TRAINING, ETC.);
- ASSESSMENT OF THE OUTPUTS OF THE SIX CORE RESEARCH DISCIPLINES (I.E., ECONOMIC AND SOCIAL SCIENCE, FISHERIES AND LIVESTOCK, CROPS, SOIL MANAGEMENT, PEST MANAGEMENT, AND WATER MANAGEMENT);
- ASSESSMENT OF THE FARMING SYSTEMS RESEARCH PROGRAM; AND
- RECOMMENDATIONS FOR AN IMPLEMENTATION PLAN FOR THE ARP-II SUPPLEMENT.
- OUTLINE SCOPE OF WORK FOR THE MOA PROPOSED ASSESSMENT OF THE AGRICULTURAL RESEARCH SYSTEM TO BE CONDUCTED BY AN INDEPENDENT EXPATRIATE - BANGLADESHI TEAM.

1) <u>ASSESSMENT OF BARC'S COORDINATION AND MANAGEMENT OF AND SUPPORT SERVICES TO THE NARS:</u>

THIS ASSESSMENT WILL FOCUS ON BARC'S MANAGEMENT AND SUPPORT SERVICES TO THE NATIONAL AGRICULTURAL RESEARCH SYSTEM. THIS INCLUDES PROVIDING

RELEVANT AND RELIABLE SUPPORT SERVICES TO THE NATION'S RESEARCH INSTITUTES. THE CENTRAL ISSUE OF THIS PHASE CONCERNS WHETHER OR NOT THE SUPPORT SERVICES OF THE NATIONAL AGRICULTURAL RESEARCH SYSTEM, THROUGH BARC, IS IMPROVING AND FUNCTIONING AT EVERY LEVEL OF THE SYSTEM. SEPARATE ASSESSMENTS SHOULD BE MADE OF CONTRACTOR/BDG PERFORMANCE IN FACILITATING OR INHIBITING THE PROGRESS IN EACH OF THE FOLLOWING ISSUES:

A) BARC'S ROLE IN FORMULATING BANGLADESH'S AGRICULTURAL RESEARCH NEEDS, NATIONAL POLICIES AND DEVELOPMENT GOALS; ITS RELATIONSHIP TO THE RESEARCH INSTITUTES AND BDG PLANNERS IN THIS REGARD;

B) THE ADEQUACY OF BARC'S AUTHORITY TO COORDINATE AGRICULTURAL RESEARCH ACTIVITIES IN BANGLADESH AND INSURE THAT THE SYSTEM WORKS EFFECTIVELY AND EFFICIENTLY;

C) BARC'S ROLE IN DEVELOPING THE NATIONAL AGRICULTURAL RESEARCH MANPOWER BASE THROUGH IN-COUNTRY AND INTERNATIONAL TRAINING PROGRAMS AND IN DEVELOPING AGRICULTURAL RESEARCH PERSONNEL POLICIES AND PROCEDURES;

D) BARC'S ROLE IN COMMUNICATING AGRICULTURAL RESEARCH AND PLANNING INFORMATION TO RESEARCH STATION MANAGERS AND SCIENTISTS;

E) BARC'S GUIDANCE IN RESEARCH FACILITIES MANAGEMENT, COMMODITIES PROCUREMENT AND MAINTENANCE; AND

F) BARC'S ROLE AND PERFORMANCE IN ALLOCATING RESEARCH RESOURCES PROVIDED BY THE BDG AND DONORS.

2) ASSESSMENT OF OUTPUTS IN CORE DISCIPLINES:

THIS DETAILED ASSESSMENT WILL FOCUS ON THE SIX CORE DISCIPLINE AREAS. THE INPUTS FOR EACH AREA INCLUDED TECHNICAL ASSISTANCE, TRAINING, COMMODITIES SUPPORT AND CONSTRUCTION. THE CENTRAL ISSUE OF THIS PART OF THE EVALUATION CONCERNS HOW WELL THE PROJECT HAS PERFORMED OVER THE LOP TO DATE AND WHAT NEEDS TO BE CARRIED OUT TO ENHANCE PERFORMANCE DURING IMPLEMENTATION OF THE SUPPLEMENT. THE MAIN ISSUES TO BE ADDRESSED ARE:

A) OVERALL PROJECT PROGRESS AND IMPACT IN RELATION TO PROJECT OBJECTIVES AND COMPLIANCE WITH THE ANNUAL WORK AND FINANCIAL PLANS; MAJOR IMPLEMENTATION BOTTLENECKS WHICH HAVE DELAYED EXECUTION; AND ANALYSIS OF ACTIONS NECESSARY TO ADDRESS THESE BOTTLENECKS AND THE TIMEFRAME REQUIRED FOR IMPLEMENTING THESE ACTIONS.

B) QUANTITATIVE AND QUALITATIVE ASSESSMENT OF RESEARCH EFFORTS IN THE SIX CORE DISCIPLINES IN TERMS OF DEFINITION OF APPROPRIATE RESEARCH STRATEGIES, EFFECTIVE IMPLEMENTATION OF RESEARCH STRATEGIES, USEFUL ANALYSIS OF THE DATA, AND FOLLOW THROUGH COMMUNICATION OF FINDINGS AND/OR RECOMMENDATIONS TO: OTHER PARTS OF THE AGRICULTURAL RESEARCH SYSTEM

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(E.G., PUBLICATIONS AND CONFERENCES); TO THE AGRICULTURAL UNIVERSITY CURRICULA; TO GOVERNMENT AND NON-GOVERNMENT ORGANIZATION EXTENSION SERVICES (E.G., REGULAR MEETINGS AND TRAINING); AND TO FARMERS (E.G., FARMER FIELD DAYS, FARMER TRAINING, AND ON-FARM RESEARCH).

C) CASES OF FEEDBACK ABOUT SUCCESSFUL RESEARCH AND COMMUNICATIONS OF THE RESEARCH TO PLANNERS AND ADMINISTRATORS TO OBTAIN ADDITIONAL BUREAUCRATIC/POLITICAL SUPPORT FOR THE NATIONAL AGRICULTURAL RESEARCH SYSTEM.

D) ASSESSMENT OF THE AMOUNT AND EFFECTIVENESS OF TRAINING SUPPORTED BY THIS PROJECT IN EACH OF THE CORE DISCIPLINES. CONSIDER PROJECT EFFECTS ON INCREASING THE NUMBER OF WELL-TRAINED RESEARCHERS, INCLUDING WOMEN, WHO CAN EFFECTIVELY WORK IN THE NARS.

E) CASES OF RESEARCH PARTIALLY OR WHOLLY SUPPORTED BY THIS PROJECT WHICH LED TO ADOPTION OF IMPROVED TECHNOLOGIES BY FARMERS RESULTING IN INCREASED RESOURCE PRODUCTIVITY, INCREASED FOOD OUTPUT, AND/OR INCREASED FARMER INCOME.

F) ASSESSMENT OF THE BENEFITS OF THE PRESENT LINKAGES BETWEEN THE BANGLADESH RESEARCH ACTIVITIES AND THOSE OF REGIONAL AND INTERNATIONAL AGENCY EFFORTS IN TERMS OF CAPTURED COMPARATIVE STRENGTHS.

G) ASSESSMENT OF THE IMPACT OF THE RESEARCH INVESTMENTS IN IMPROVING THE AGRICULTURAL PRODUCTIVITY AND INCOME GENERATION OF RURAL HOUSEHOLDS, INCLUDING WOMEN (E.G., INITIATION OF NEW OPPORTUNITIES FOR PRODUCTIVITY; IMPROVED ACCESS TO TRAINING OPPORTUNITIES; AND IMPROVED INTERACTION BETWEEN FIELD STATION AND FSR SITE STAFF, RURAL WOMEN, AND EXTENSION WORKERS WORKING WITH RURAL WOMEN).

H) ASSESSMENT OF A ROLE PLAYED BY THE TECHNICAL ASSISTANCE SPECIALISTS IN FACILITATING PART OR ALL OF THE ABOVE.

3) <u>ASSESSMENT OF THE FARMING SYSTEMS RESEARCH PROGRAM:</u>

THIS ASSESSMENT WILL FOCUS ON THE NATION'S MULTI-INSTITUTIONAL, MULTI-DISCIPLINARY RESEARCH PROGRAM. EMPHASIS AT THE NATION'S FARMING SYSTEMS SITES TO DATE HAS BEEN ON DEVELOPING CROPPING SYSTEMS RESEARCH (CSR) WITH LESS DONE ON OTHER ACTIVITIES OF A FARMING SYSTEM. THE CENTRAL ISSUE OF THIS PART CONCERNS HOW MUCH OF AN IMPACT HAS THE ARF-II PROJECT HAD ON THE NATIONAL FARMING SYSTEMS RESEARCH PROGRAM. THE FOUR MAJOR ISSUES TO BE ADDRESSED ARE:

A) HAVE APPROPRIATE FARMER TECHNOLOGIES BEEN DEVELOPED IN FARMERS' FIELDS THROUGH THE NATIONAL FARMING SYSTEMS RESEARCH PROGRAM (I.E. FARMING SYSTEMS SITES OPERATIONAL)? TO WHAT DEGREE HAVE THE FSR SITES,

REGIONAL RESEARCH STATIONS, OR CENTRAL RESEARCH INSTITUTES PRODUCED IMPROVED VARIETIES, CROPPING PATTERNS, OR AGRICULTURAL TECHNOLOGIES THAT HAVE PROVED FEASIBLE AND BEEN ADOPTED BY LOCAL FARMERS, INCREASING RESOURCE PRODUCTIVITY AND/OR HOUSEHOLD INCOME?

B) ARE THE RESEARCH INSTITUTES EFFECTIVELY COORDINATING AND COOPERATING AT SINGLE FARMING SYSTEM SITES, AND ARE THEY EFFECTIVELY CONDUCTING FARMING SYSTEMS RESEARCH? ARE THERE ADMINISTRATIVE BOTTLENECKS TO DOING THIS? WHAT ACTIONS ARE NECESSARY IN THE IMPLEMENTATION OF THE ARP-II SUPPLEMENT TO OVERCOME THESE BOTTLENECKS?

C) ARE THE AGRICULTURAL RESEARCH INSTITUTIONS INCREASING THEIR CAPACITY TO CONDUCT RELEVANT RESEARCH AT THE FSR SITES AND TO FACILITATE THE DELIVERY OF RESEARCH RESULTS TO FARMERS AND EXTENSION PERSONNEL?

D) WHAT IMPACT HAS THE ARP-II PROJECT HAD ON THE NATIONAL FARMING SYSTEMS RESEARCH PROGRAM? WHAT ACTIONS ARE NECESSARY TO ADDRESS PRESENT CONSTRAINTS/WEAKNESSES IN THE IMPLEMENTATION OF THE ARP-II SUPPLEMENT?

4) RECOMMENDATIONS FOR AN IMPLEMENTATION PLAN:

THE MAIN PRODUCT OF THIS EFFORT IS TO WRITE RECOMMENDATIONS FOR AN IMPLEMENTATION PLAN FOR THE ARP-II SUPPLEMENT. RECOMMENDATIONS AND "LESSONS LEARNED" SHOULD INTEGRATE THE FINDINGS OF THE FIRST THREE PARTS OF THE EVALUATION AND CLEARLY SPECIFY HOW THESE PROPOSED CHANGES COULD FURTHER ENHANCE THE LIKELIHOOD OF THE PROJECT ACHIEVING ITS' OVERALL OBJECTIVES. THE RECOMMENDATIONS FOR THE IMPLEMENTATION PLAN SHOULD BE SPECIFIC ABOUT THE APPROPRIATE LEVELS OF EFFORT AND RECOMMEND MODIFICATIONS/CHANGES/OR ADDITIONAL COMPONENTS REQUIRED IN REGARD TO THE ARP-II SUPPLEMENT.

IN DEVELOPING THE IMPLEMENTATION PLAN RECOMMENDATIONS, ATTENTION NEEDS TO BE GIVEN TO TRAINING, STAFFING AND BUDGETING PLANS OF THE NARS TO ENSURE THAT THESE EFFORTS ARE SUFFICIENT TO OPERATE AND MAINTAIN FACILITIES AND EQUIPMENT BEING PROVIDED BY THE PROJECT.

5) OUTLINE SCOPE OF WORK FOR ASSESSMENT OF AGRICULTURAL RESEARCH SYSTEM

THIS OUTPUT RESPONDS DIRECTLY TO THE REQUEST BY THE SECRETARY OF THE MINISTRY OF AGRICULTURE THAT THIS EVALUATION TEAM PROVIDE SOME INPUT INTO THE DEVELOPMENT OF A SCOPE OF WORK FOR A PROPOSED ASSESSMENT OF THE TOTAL AGRICULTURAL RESEARCH SYSTEM IN BANGLADESH. THE TEAM PRODUCT WOULD

CONSIST OF AN OUTLINE SCOPE OF WORK PROVIDED TO THE MOA AND USAID. THE ASSESSMENT WOULD FOCUS ON: ASSESSING THE TECHNICAL AND ECONOMIC IMPACTS ON THE AGRICULTURAL RESEARCH SYSTEM OF ALL DONOR AND BDG EFFORTS IN THE LAST DECADE AND SUGGESTING A MOA STRATEGY FOR FUTURE EFFORTS.

METHODOLOGY AND PROCEDURES:

DATA COLLECTION ACTIVITIES WILL INVOLVE AT LEAST THREE STEPS. 1) A REVIEW OF EXISTING PROJECT DOCUMENTATION INCLUDING THE PROJECT PAPER, PREVIOUS EVALUATIONS, ANNUAL WORK/FINANCIAL PLANS AND SELECTED PROJECT PROGRESS REPORTS; 2) MEETING WITH BDG AND USAID PROJECT LEADERS AS WELL AS TECHNICAL CONSULTANTS IN BANGLADESH; AND 3) SITE VISITS TO SOME RESEARCH INSTITUTES, FIELD STATIONS AND SUB-STATIONS AND FSR SITES IN BANGLADESH. BECAUSE, PREVIOUS EVALUATIONS INDICATED A NEED FOR PRELIMINARY FIELD DATA COLLECTION PRIOR TO THE ARRIVAL OF THE EXTERNAL EVALUATION TEAM, THIS ACTIVITY HAS ALREADY BEEN CARRIED OUT BY A JOINT USAID-BANGLADESH RAPID RURAL APPRAISAL TEAM. THE DATA COLLECTED AND SUMMARIZED BY THIS TEAM INCLUDES: STATISTICS ON PUBLICATIONS, CONFERENCES, AND FARMER FIELD DAYS; A FARMER SURVEY; SEMI-STRUCTURED INTERVIEWS WITH FIELD RESEARCH AND FIELD EXTENSION PERSONNEL; AND CASES

OF ADOPTION AND NON-ADOPTION OF NEW TECHNOLOGIES. SUMMARIES OF THIS DATA WILL BE MADE AVAILABLE TO THE EXTERNAL EVALUATION TEAM TO BE COMBINED WITH THEIR OTHER FINDINGS AS A BASIS FOR THEIR ANALYSIS. SOME MEMBERS OF THE RRA TEAM WILL WORK WITH THE EXTERNAL EVALUATION TEAM.

EXTERNAL EVALUATION TEAM COMPOSITION AND PROPOSED TIMING OF WORK:

THE EXPATRIATE TEAM COMPOSITION WILL CONSIST OF THREE MEMBERS:

- A RESEARCH SYSTEMS MANAGEMENT SPECIALIST WITH MONITORING AND EVALUATION EXPERIENCE. HE/SHE WILL ALSO BE DESIGNATED AS THE TEAM LEADER AND WILL BE RESPONSIBLE FOR PREPARATION OF THE FINAL REPORT.
- AN AGRICULTURAL ECONOMIST WITH A BROAD RANGE OF EXPERIENCE IN AGRICULTURAL RESEARCH; AND
- AN AGRICULTURAL RESEARCH SCIENTIST WITH A BROAD RANGE OF EXPERIENCE IN AGRICULTURAL RESEARCH, INCLUDING FARMING SYSTEMS RESEARCH.

ALL TEAM MEMBERS ARE REQUIRED TO HAVE AT LEAST FIVE YEARS OF EXPERIENCE IN REVIEWING AND EVALUATING AGRICULTURAL RESEARCH PROJECTS AND POSSESS EXCELLENT WRITING SKILLS. THE EXPATRIATE AND BANGLADESHI CONSULTANTS ARE EXPECTED TO START IN LATE SEPTEMBER, 1987 AND COMPLETE THE SCOPE OF WORK IN 35 WORKING DAYS WITH A SIX DAY WORK WEEK.

THE BANGLADESHI TEAM MEMBERS WILL CONSIST OF TWO SENIOR AGRICULTURAL RESEARCH SPECIALISTS WHO PARTICIPATED IN THE PRELIMINARY RAPID RURAL APPRAISAL ACTIVITY.

METHOD OF PAYMENT:

AID/W WILL CONTRACT WITH A U.S. FIRM WHICH WILL PROVIDE THE THREE EXPATRIATE SPECIALISTS AND THE TWO LOCAL CONSULTANTS WHO CARRIED OUT THE INITIAL RAPID RURAL APPRAISAL. THE U.S. FIRM SHOULD CONSULT WITH THE MISSION BEFORE APPOINTING THE LOCAL CONSULTANTS.

REPORTING REQUIREMENTS:

THE REPORT WILL CONTAIN THE FOLLOWING SECTIONS.

- EXECUTIVE SUMMARY (TWO PAGES, SINGLE SPACED, INCLUDING STATEMENT OF PURPOSE OF THE PROJECT AND OF THE EVALUATION);
- STATEMENT OF MAJOR FINDINGS AND CONCLUSIONS (SHORT AND SUCCINCT WITH TOPIC OR SUBJECT IDENTIFIED BY SUBHEAD);
- RECOMMENDATIONS CORRESPONDING TO MAJOR FINDINGS AND SPECIFYING WHO OR WHICH AGENCY SHOULD TAKE THE RECOMMENDED ACTION;
- BODY OF THE REPORT WILL PROVIDE THE INFORMATION ON WHICH THE MAJOR FINDINGS AND RECOMMENDATIONS WERE BASED AND INCLUDE A DESCRIPTION OF THE COUNTRY CONTEXT IN WHICH THE PROJECT WAS DEVELOPED;
- RECOMMENDATIONS FOR AN IMPLEMENTATION PLAN FOR THE ARP-II SUPPLEMENT;
- PROJECT AND EVALUATION DATA FACESHEET (FORM PROVIDED BY PROGRAM OFFICE);
- COMPLETED PORTIONS OF THE EVALUATION SUMMARY FOR THE PROJECT (I.E., SECTION H - EVALUATION ABSTRACT AND SECTION J - SUMMARY OF EVALUATION FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS); AND
- APPENDICES AS NECESSARY (INCLUDING EVALUATION SCOPE OF WORK AND STATEMENT OF METHODOLOGY USED).

- OUTLINE SCOPE OF WORK FOR THE PROPOSED MOA ASSESSMENT OF THE AGRICULTURAL RESEARCH SYSTEM.

SEVEN COPIES OF THE INITIAL DRAFT OF THE REPORT WILL BE SUBMITTED TO USAID AND EIGHT TO BARC FOR REVIEW. FIVE COPIES OF THE FINAL REPORT WILL BE SUBMITTED TO AND APPROVED BY USAID PRIOR TO THE TEAM LEADER'S DEPARTURE.

A N N E X B

METHOD AND PROCEDURE

ANNEX B. METHOD AND PROCEDURE

I. METHOD:

The method of the evaluation was authoritative/judgemental. The evaluators viewed the evidence available to them in a prescribed time frame and responded to a prescribed list of questions. (Annex A). In general, the questions were, how well did the project do and what should be done in a supplemental project? Judgements were qualitative and instructional. This method is appropriate in that implementation of the project has been adequately quantified elsewhere.

II. PROCEDURE: The team consisted of two subgroups. The first group collected both primary and secondary data. The second group, which included members of the first group, had access to data collected by the first.

In the Spring, 1987, the first group conducted a rapid, rural appraisal of the project in the field, employing a survey, semi-structured interviews and field observations. They also collected field documents and reports. (Annex C).

In the fall, 1987, the second group made a brief reconnaisance of the project, then wrote the paper, using secondary data, including the rapid rural appraisal (Annex C).

A N N E X C

RAPID RURAL APPRAISAL

Annex C

AGRICULTURAL RESEARCH PROJECT - II: RAPID RURAL APPRAISAL REPORT

FIELD VISITS - SPRING, 1987

DRAFT PREPARATION - SEPTEMBER, 1987

TEAM MEMBERS:

Team Leader: Dr. Kay Calavan, USAID M&E Specialist

Team Members: Dr. M. Siddique Ahmad, Former Director, BRRI
Dr. Monawar Ahmad, Prof.& Former Dean,Fac. of Agric.,BAU
Mr. Latifur Rahman, USAID Agric. Specialist
Mr. Habibur Rahman, USAID Agric. Specialist
Mr. Manir Uzzaman, USAID Pub. Admin. Specialist

FINAL DRAFT

AGRICULTURAL RESEARCH PROJECT - II: RAPID RURAL APPRAISAL REPORT

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AGRICULTURAL RESEARCH PROJECT -II: RAPID RURAL APPRAISAL REPORT
SPRING, 1987

SECTION 1 - INTRODUCTION

1.1 REPORT OBJECTIVES

This Rapid Rural Appraisal (RRA)activity was carried out by a joint USAID-Bangladeshi Team prior to the arrival of the External Evaluation Team. The objectives were to collect and summarize field data measuring impacts and problems of the six-year Agricultural Research Project - Phase II (ARP-II). This preliminary appraisal was deemed necessary for the following reasons:

- No monitoring system in place for the ARP-II.
- Past experience demonstrated External Evaluation Teams with broad scopes of work have limited time for field visits.
- Due to unforeseen circumstances the Project and TA staff were phasing out before the External Evaluation Team's arrival.

The Rapid Rural Appraisal Team consisted of the following members:

Team Leader - Mission PSC Evaluation Specialist
Members - 2 experienced and respected Bangladeshi agricultural scientists (one from the Bangladesh Agricultural University and one retired BRRI scientist)
- 3 Mission Foreign Service Nationals (one full-time and 2 part-time on this activity)

The RRA Team spent 6 weeks in the field visiting 27 locations (see Itinerary and Map 1) including the following:

- 6 Regional Agricultural Research Stations (RARS) (4 BARI & 2 BRRI)
- 7 Agricultural Research Substations
- 6 Farming System Research (FSR) Sites
- 8 Multiple Location Testing (MLT) Sites
- 2 Pilot Production Program (PPP) Sites
- Other institutes in the agricultural research system (i.e.,BAU, BFRI, BARC, SRTI, BINA, FRI, Soil Analysis Lab)
- 12 Agricultural Extension offices
- 4 Farmer control areas (i.e., areas with no agricultural research programs or nearby facilities)
- 5 Agricultural Research Institute HQs (i.e., BARI, BRRI, BJRI, BLRI, DLS)

In addition, the Team interviewed 7 Winrock International TA specialists who were leaving due to completed contracts.

The key management questions in the Evaluation SOW that the RRA Team were addressing were the ones listed below. It is recognized that this

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brief appraisal effort would not necessarily answer the questions, but would pull together any available data and collect some additional relevant data.

1.-Have ARP-II and PL-480 inputs improved the research process in the 6 core disciplines so technologies relevant to farmer needs have been generated? (This question was looked at from the field perspective as we attempted to understand the current research planning, implementation, and analysis process and the application of any useful improved technologies in the field context.)

2.-To what extent have improved technologies been disseminated to extension workers and farmers and adopted by Bangladeshi farmers? (We were specifically looking for both successful and problem cases.)

3.-Have yields, productivity, or farm income increased as a result of USAID inputs in this project or other projects?

4.-Assess the problems and accomplishments of the Cropping Systems Research/ Farming Systems Research Programs (CSR/FSR) which have been supported by ARP-II and IDA funding? Can the FSR Program operate effectively in Bangladesh? What will it take to make this Program work?

1.2 DATA COLLECTION METHODS

The RRA Team used the following data collection methods to address the questions listed above.

1.-Semi-Structured Interviews

-TA Specialists (i.e., Winrock Specialists located at institute headquarters and Associate Production Agronomists located at the BARI Regional Stations).

-Principal Scientific Officer (PSO) -in-charge and key research officers at agricultural field stations.

-Key Department of Agricultural Extension (DAE) officers in various field locations.

2.-Structured Surveys

-General survey of each research station visited (see Table ', Map 1, & Appendix 1)

-Survey of all available research officers at field stations visited (see Table 2 & Appendix 1).

-Survey of key DAE officers at sites visited (see Table 3 & Appendix 1).

-Farmer Interviews (sample = 120) with opportunity samples drawn from FSR sites and surrounding areas, MLT and PPP sites visited, and control

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areas having no agricultural research programs (see Table4 & Appendix 2).

3.-Observations

-Research equipment and station resources

-On-station and on-farm field trials and field days

-District and Regional Technical Committee Meetings

4.-Systematic Collection of Field Reports and Documents

The Team looked for evidence of the research process in the field research stations and data to document adoption and non-adoption of new technology.

1.3 PROBLEMS IN THE RAPID RURAL APPRAISAL EFFORT

There were some problems which reduced the effectiveness of this assessment effort. First, of the four Mission staff involved, three were able to work only intermittently on the Appraisal because of other USAID office work priorities. Second, one of the two Bangladeshi scientists was not hired until the team had already completed 1/3 of the field visits. Most importantly, the smaller than expected team with its changing composition had too many jobs to do in the field and couldn't maintain a uniform interviewing procedure in farmer interviews. This was compounded by the fact that no team time was allotted to do a pilot farmer survey to work out the bugs in the interview schedule and in the team interview procedures before actual site visits began. In addition, the analysis of the farmer interview data in the dBase III Plus system and the translation of the data to a system more amenable to cross tabulation (e.g., REFLEX) has been delayed because the Mission has not received necessary software from Washington. Finally, we ran out of team time for a complete team synthesis and write up of our findings and conclusions.

1.4 PRESENTATION OF RRA MATERIALS AND FINDINGS

The RRA Team summaries and materials are organized in the following sections:

I - General Summary of Team Findings and Conclusions (including summary tables and maps) -- This is the present report.

II - Profile Materials: Summaries of data collected at specific RARS, FSR Sites, other institutes, and DAE offices. This also includes summaries of findings about the MLT and PPP Programs, and linkages with the agricultural extension system.

III - Collection of Reports and Other Documents (organized by specific field station).

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SECTION 2 - REGIONALIZATION OF AGRICULTURAL RESEARCH

2.1 Definition of Regional Research

With the development of the Regional Stations, CSR/FSR sites, and now MLT sites through the support of ARP-II, PL 480, and other donor support (primarily IDA support), there is an increasing awareness of farm production problems in specific regions by research staff posted to these regions (see Chronology of agricultural research development in Bangladesh and Map 1 showing agricultural research field station locations). Dialogues have been started between farmers in local areas and the agricultural researchers posted to those areas. The first easy benefits from new general purpose rice and wheat HYV and some fertilizer and water inputs have been realized; now the more difficult research in local and marginal areas is required for additional but slower payoffs.

There are several factors contributing to this increased regionalization of agricultural research. It is obvious that most of this has occurred since 1980 with the development of the present research station function (as opposed to the former seed multiplication function) of BARI and BRRI Regional Agricultural Research Stations (RARS) and the establishment of Substations, CSR/FSR sites, and now MLT and PPP sites (see Chronology). Critical donor support for this regionalization of agricultural research has been provided by USAID's ARP-I and ARP-II projects and IDA's Extension and Research Project and AGricultural Research Project. Specific contributing factors include the following:

1.- Systematic development of an information base about local farm production conditions for agricultural researchers at regional stations. This has been initiated by data collection at CSR/FSR sites including: site agro-ecological analysis, socio-economic benchmark studies, some focussed agricultural production and economic surveys, a few case studies of local farmer practices and constraints, and recent house compound surveys.

However, with the recent establishment of the 83 Multiple Location Testing (MLT) sites, some regional agricultural research officers have realized there are limitations in extrapolating findings about farmers and agricultural production constraints from the specific CSR/FSR sites to other local areas in the same region or even in the same or adjacent districts. Because of expanding contacts with farmers through testing of improved technologies (developed at FSR sites) at MLT sites throughout the country, officers have begun to recognize the importance of considering local diversity in the transfer of improved technology. (i.e., technology must be adapted to site specific conditions). In fact, some young OFRD officers working at the MLT sites are finding that farmers require that they consider local site conditions. In effect this results in a mini CSR/FSR approach at the MLT sites.

Another qualification of this information base is that it is mainly on paper in scattered reports and is only useful when pulled together as a working fund of knowledge by researchers at a local station for designing and interpreting research. This cannot happen when there are frequent transfers of regional station, CSR/FSR site, or MLT site staff. TA Associate Production Agronomists (APA) located at the regional stations were often able to provide continuity and synthesis of this information

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base. Also, researchers who remain longer than a year or two can provide some local memory and synthesis. At the CSR/FSR program at Bangladesh Agricultural University (BAU) there has been more continuity with the FSR Project Coordinator and site staff.

2. - Institutionalization at BRRI and BARI of on-farm research units to conduct on-farm trials and carry on the main dialogue between a) the agricultural research system and b) extension personnel and farmers. At BRRI this critical function has been carried out by both the Adaptive Research and Training Division (ARTD) and the more recently formed Rice Cropping System Division (RCSD). At BARI the On-Farm Research Division (OFRD) was established in 1984-85 with an expanded number of FSR sites (see Map 2), the Multiple Location Testing Program and sites, and the Pilot Production Program (developed by 1987). The energetic architect and CSO of the BARI OFRD Program, Joynal Abedin, had worked out part oithe model for this systematic dialogue between researchers and farmers/extension agents i his earlier work in the IDA Extension and Research Project (ERP) carried ou in the Northwestern Region of Bangladesh. USAID's ARP-II project provided him with technical assistance and some support for training and CSR/FSR staff in developing his program concept. The TA included a Production Agronomist, Ed Perdon, who worked with Abedin at BARI and three Associate Production Agronomists working at three Regional Agricultural Research Stations (i.e., Paul Villegas at Jessore, R.N. Mallick at Ishurdi, and N. Vignarajah at Jamalpur).

Since the mandate for the recently organized OFRD at BARI is to conduct on-farm trials and elicit information about local agricultural constraints and potential from farmers and extension agents, this research Division allows and encourages more regional autonomy in research planning. OFRD consists of 90 -95% field-staff working at their 10 CSR/FSR sites, MLT sites, and PPP sites. As a consequence, we found field researcher estimate of approximately 80 - 90% of the OFRD research trials initiated and designe at the Regional Stations (see Table 5 of Estimates of Program Initiation). This contrasts with field researcher estimates of 60 - 80% of the research of other Divisions at the RARS determined by national research programs defined by BARI HQ. This latter percentage represents a real shift from full HQ control to some field autonomy in the last 4-5 years. One APA who came in 1980-81 noted that at that time all station research was designed and analyzed at HQ. It is important to note that the HQ point of view is that field research is determined from the "bottom up". An accurate assessment would require tracking the research decision-making process for each Division.

In the agricultural research system, the experienced OFRD of BARI and the Adaptive Research and Training Division and the Rice Cropping System Division (RCSD) at BRRI know the most about local farmer production constraints and potential. It is natural that their on-farm research trials reflect this knowledge. Scientific officers in other Divisions are often involved in commodity improvement programs which are HQ-oriented, and generally the HQ scientists seldom make extensive visits to local stations to talk with local farmers and extension agents.

3. - Associate Production Agronomists of the ARP-II TA team living and working at specific RARS contributed significantly to the regional emphasis of agricultural research. This emphasis has been documented in interviews

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with these TA staff and in their reports, and corroborated by interviews with their counterparts at the RARS. The Scientific Officers at each station that had an Associate Production Agronomist explicity stated tha this TA effort made a significant difference in the research progress at station. The approach of these TA staff in working with both OFRD workin at the CSR/FSR sites and other Division research scientists posted to the RARS has been to encourage the scientists to make research more relevant farmers. They have encouraged field researchers to think in terms of the question "What are the farmers' needs in terms of agricultural research?" They have tried to make the distinction between an applied versus an academic approach in the field stations (see final reports of these TA staff). Because of their location at the RARS and their lengthy interact with field research scientists, local extension personnel, and local farmers, they were able to foster this research approach and a more activ research dialogue. Also, they sometimes acted as liaison with Division CS at HQ to persuade them of the value of certain proposed regional research projects and to remove administrative constraints for timely implementati of trials. Scientists at the one Regional Research Station which lost an APA after one and one half years (Hathazari) complained that this loss m a major difference in the slow research progress at their station. This type of regional TA position should be a key part of the ARP-II Supplemen Project.

4. - Local Research Review Workshops. These workshops held at RARS have been organized mainly through the efforts of the Associate Production Agronomists. The first one was organized by Paul Villegas in Jessore in 1982, later at Ishurdi by Mallick and Joynal Abedin (1984), and then at Jamalpur by Ed Perdon (1985) and Vignarajah (1985-87). These have now perhaps been institutionalized at these stations with the encouragement o the OFRD at BARI HQ. The participants at the RARS Internal Review Worksho have primarily been OFRD scientific officers, some officers from other research Divisions, and relevant DAE officers. The research officers present their research findings and analyses for the previous season(s); the relevance of these are discussed by the group; and then plans for follow-on research and research plans for the following season are discussed. This provides an opportunity for formulating regional researc priorities and plans prior to the review and planning sessions at BARI HQ. This has definitely increased the amount of at least OFRD research originating from the regional areas, and this research is more likely to consider local farmer needs.

5. - PSO's in-charge at the RARS ensuring most scientific officers from a research Divisions attend fielddays at the stations and substations, the FSR sites, and the MLT sites to participate in the discussions with farme and extension representatives. This has been initiated in Jessore, Ishurd and Jamalpur. This reflects a new concept of the job of the scientists from the older non-OFRD research Divisions -- that they are to be informe about farmers' needs and incorporate these into their research strategies. This is in contrast to the previous research emphasis on HQ derived research priorities.

2.2 Examples of Regional Research Initiatives

The RRA team found the following examples, among others, of research

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carried out or planned to meet local farmer needs. One can find more information about these in each of the station profiles and in research reports:

1. - Improved Vegetable Production. Because farmers have expressed an interest in this, all stations have done some work in this. Hathazari RARS has had a strong interest in vegetable production for many years because farmers in that Chittagong area have traditionally been primary vegetable producers in Bangladesh. However, this station lamented that they had not received any ARP-II assistance or BARI support in doing research in this area. All regional stations are trying to respond to farmers' interest in vegetable production.

2. - Homestead Gardening Project. Mallick, the APA, was instrumental in getting this research program started at the Kalikapur FSR site at Ishurdi. This happened in spite of disagreements at BARI HQ between the OFRD and the Horticulture Divisions about the organization of this. A particular emphasis in this research effort has been the development of a year-round growing plan to experiment with summer vegetable possibilities in addition to the usual winter vegetables. Some manual water pumps have been installed on a pilot basis and others are going to be made available to cooperator farmers in this project.

3. - Seed Producing Vegetables (e.g., cabbage, potato). Ishurdi RARS is working on this research to meet the needs of poor farmers who now have to depend on expensive and sometimes unavailable imported seed or sets.

4. - Development of Wheat Varieties Adapted to Specific Local Conditions. Jessore RARs is working on the development of wheat varieties beyond the present general purpose varieties. They are particularly looking at qualities of heat tolerance at early stage for earlier planting in lowland areas to use residual moisture and heat and drought tolerance at a later stage for later planting. Both varietal types would ensure double or triple cropping in the Jessore region as well as other areas.

5. - MLT Site Field Trial Comparing Recommended and Farmer Potato Planting Methods. In Jessore, the OFRD responded to farmer doubts about the yield advantages of recommended planting spacing (60x30 cm) and planting methods. In this trial, the farmers' method of 45x30 cm spacing outproduced the recommended method in total kg.

6. - Sunflower as a New Alternative Winter Crop. In Ishurdi (Kalikapur FSR site and Pabna substation), OFRD officers are conducting trials on the sunflower for oil and seed production. It would be an alternative winter crop when the rains are not sufficient for wheat or rice production (?). The main problems noted by farmers at a fieldday is that they don't know how to process it for oil or other uses, they are not certain they will like the taste, and seed is probably not yet available. For new crops like these, processing and cooking demonstrations are needed at fielddays. Also, sufficient seed production is a problem.

7. - Peanuts and Sweet Potatoes. At Jamalpur FSR site, peanuts and sweet potatoes are used in on-farm trials for high land areas.

8. - Aroids In and Near House Compounds. At Jamalpur, the APA initiated

FSR site research which found that aroids can usefully be grown in or near homestead compounds because livestock do not consume these plants.

9. - Turmeric and Ginger. The OFRD officers who have worked at Chatmohar MLT site in Pabna District are planning research trials with tumeric and ginger because farmers in that location have requested assistance with their crops.

10. - Relay Wheat in Deep Water Rice area. In the Narail MLT site in the Jessore region, there have been on-farm trials sowing relay wheat in deep water rice fields with a 12-15 day overlap period. Researchers are trying to develop a double cropping pattern with two cereals in an area where there are few tube wells but are clay soils with some residual moisture after the Aman rice harvest.

11. - Banana Varietal Resistance to Fusarium. Jessore region is the important area for banana production. The Jessore RARS has been addressing this farmer problem.

2.3 Obstacles to Regionalization of Research

The obstacles discussed here and above (insufficient staffing and lack of access to advanced degree training) were identified by research scientists at the regional stations in our interviews with them. This discussion is from the point of view of the scientific officers posted in the regional stations. There may be countervailing points that can be made by scientists at BARI HQ.

1. - National Crop Testing Programs. These centrally planned research programs take up a significant portion of the crop research resources (i.e., staff time, station land, on - farm research land, research funds). This claim on significant regional research resources may be justified in some cases and in others may be merely continuation of an earlier allocation of resources when regional stations were more like substations of HQ. An extreme example of a waste of scarce resources for less relevant research for a specific region are the wheat breeding trials at the Chittagong RARS (Hathazari). Production of wheat is not very relevant for this Southern region. There are higher local farmer research priorities (e.g., vegetables and fruits) which cannot be addressed because of scarce research resources. One problem is that the Chittagong RARS serves a large and highly diverse region including Comilla and Sylhet. National commodity research programs should be reviewed to determine relative payoffs of specific trials at particular regional stations and substations.

2. - Need for Identification of Agro-Ecological-Economic Zones. There is a need to systematically identify distinctive zones considering soil asociations, flooding levels, rainfall patterns, irrigation facilities, crops traditionally grown, and other ecological and economic parameters. The problem is that researchers are finding that RARS or FSR site conditions and research findings cannot necessarily be extrapolated for an entire region or even an entire District or Upazila. Certainly the Regions are too large and show too much diversity for this type of extrapolation. A systematic survey would identify diverse zones for research scientists and extension officers. This approach was described in the Jamalpur

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Statement of Objectives for their FSR and MLT Programs. The OFRD of BARI is the research Division most aware of local diversity as its scientific officers attempt to transfer improved technology developed at the CSK/FSR sites.

3. - RARS Need Useful Local Maps. The regional researchers need better maps detailing the features listed in point 2 above as well as irrigation command areas, ponds, roads, villages, markets and upazila locations. There are some soil maps. This is critical with the frequent transfer of research officers. Before our team could conduct farmer interviews around FSR sites, we had to prepare rough sketch maps using the memory of field assistants to determine our sampling procedures. USAID, CARE, and the Ministry of Local Government have been discussing the preparation of such maps from some of the SPARSSO photos. Some donor projects have already contracted with them to prepare special purpose maps (e.g., fisheries resources). BARC and its donors, USAID and IDA, should look into the possibility of getting a set of maps prepared for regional stations and especially for the FSR and MLT site research.

SECTION 3 STAFFING AND TRAINING ISSUES

3.1 STAFFING ISSUES

Table 6 gives some idea of the number of posts in all research Divisions at BARI stations. We have attempted to determine the number of vacancies, the number of officers absent on lengthy leave, and the number of recently filled posts. The latter figure is important because there has been a four year freeze on Government hiring for budgetary reasons. This embargo was recently lifted for a brief time to fill some positions, including some of these at field stations. For most of the period of the ARP-II the understaffing problem was greater than indicated by the filled posts in this table. A better indication of the researchers operating at any station at one time is the fact that on our visit to Ishurdi RARS we found that of the 38 scientific officer posts provided, 18 of the posts were either unfilled or had staff away on extended training (sometimes several months or a couple of years) or on other leave activities (e.g., visits to Dhaka to take care of personal business). Of the 28 filled posts at Hathazari, 12-14 officers were away on training or on other leave when we made our visit. Also, at several sites we met some field research scientists who had been trained in one discipline and transferred to posts in another discipline because of promotional opportunities. Additional in-service training is required in such cases.

Our data indicates the following conspicuous BARI RARS staffing deficiencies:

1. - <u>No Appointments to Station Chief Scientific Officer (CSO) Positions.</u> This means that no one has been given clear authority and time for overall supervision of research and station management. In all cases, a Principal Scientific Officer (PSO) of one of the research Divisions has been appointed as "in-charge" and also must carry out and neglect many of his original assigned duties. An example is the PSO of OFRD at Jamalpur who is in-charge and is filling three other vacancies (CSO, PSO Station for wheat multiplication, and SO Farm for seed multiplication).

2. - <u>No Appointments to Farm Manager Positions.</u> This critical position which includes organization of research schedules on scarce station land, improving and maintaining irrigation and equipment systems, and seed multiplication also usually falls to the PSO in-charge.

3. - <u>Few Engineers Appointed.</u> Until recently there was only one engineer appointed. There is competition for any engineer appointed to work as the Agricultural Engineer to set up and repair station machinery or as the Water Management Engineer to work on Water Management research.

4. - <u>Few Horticulturalists Appointed.</u> Several station Horticultural positions have only recently been filled. All regional stations noted they had no expertise in this area to carry out the large amount of research needed. One observer pointed out that the regional stations had been requesting Horticultural scientists for a few years while at the same time there are about 30 such researchers at BARI HQ. In fact, there are about 20-22 BARI Horticulturalists posted throughout the country. However, these are mainly fruit production specialists posted to more isolated fruit

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research stations. The regional stations need vegetable production specialists and some fruit production specialists for support of the Farming Systems Research Programme.

5. -Insufficient Agricultural Economists. One of the two station positions has only been recently filled (i.e., Hathazari). All stations felt they needed this expertise to properly design and analyze experiments and determine economic benefits of improved technologies at the station. The OFRD have been able to hire 10 economists for the CSR/FSR sites. The OFRD has only been able to hire one rural sociologist so far. The OFRD has less problems with research staffing because many positions for CSR/FSR sites are being funded by USAID and IDA as temporary contract positions. However, with the expansion of the number of CSR/FSR sites from 6 to 12 and the inclusion of 83 MLT sites thin or insufficient staffing is a problem.

6. - Plant Pathologists and Entomologists. There are several filled positions but these researchers are not as effective as they could be if they had good quality training and supervision and better equipment.

7. - One highly productive OFRD research team at Ishurdi RARS increased over a 2 year period from one researcher to 9 (both permanent staff and contract staff) and now is down to 3 researchers. During this time one of the Associate Production Agronomists (Mallick) was able to work with this team and train them in CSR/FSR and MLT work. They designed and conducted many useful on-farm trials at the Kalikapur site and produced some fairly high quality reports on their research. This is an instructive but unusual case of a young, well-manned unit provided with excellent TA support. Most members of this well-trained team have now been dispersed to be site coordinators at other FSR sites. Another example from Ishurdi RARS is that since the transfer of the Pulse Research Program HQ to this regional station with the related increase of scientific manpower (5-6 new people including a PSO with a Ph.D.) the quantity of experiments have increased from 100 to 200 a year.

8. - Frequent Transfers. Several field researchers noted the problem of too frequent transfers of staff (often less than two years). We also found cases where scientists were transferred more than once within a single year. This results in lack of: research team-building and commitment of researchers to a particular research location and its research needs. The researchers argued that they often did not have time to develop expertise and a fruitful sequence of research on a particular crop or crop pattern because of frequent transfers. At least 3-5 years is needed for design, implementation, and analysis of a useful research sequence. Upward mobility in the research system is related to transfers until a researcher reaches HQ.

9. - Top Heavy HQ/ Understaffed RARS. Officers in the field argued that research scientists at Joydepur HQ were underemployed because of the large numbers that refused to be assigned to regional stations. Apparently a regulation was provided a few years back that researchers had to be posted to regional stations after a certain number of years at HQ. However, it could never be enforced. One TA person argued that there was more productivity per researcher in the regional stations. He gave as an example the case of one Senior Scientific Officer in the Oil Seeds Program

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posted at Jamalpur who conducted half the number of experiments conducted by six officers in the BARI Oil Seeds Program at JoydepurHQ.

In contrast, the OFRD of BARI is a new unit that is mainly a field organization with most upward mobility in field positions and a small research management core at HQ.

10. - Few Incentives for RARS and Substation Staff. There is some bitterness by those who have been posted to regional stations about the fact that they do not receive an equal chance for overseas fellowships and promotions compared to those who are located at HQ. It has been argued by TA staff and some research officers that they should have fellowship incentives, hardship allowance incentives, special merit considerations for promotions for outstanding regional research work, and/or educational allowances to provide better schooling opportunities for their children. To support regionalization of research, the ARP-II Supplement could earmark certain overseas training opportunities for those doing outstanding work in regional stations.

3.2 TRAINING

1. - The perception in the regional stations is that most foreign degree training opportunities go to staff at HQ or BARC who are able to lobby more easily for the fellowships. Also, these Ph.D. and M.S. degree returnees usually return to HQ or BARC so their expertise is not available to the RARS. We found two Ph.D. officers in the regional stations, one the PSO of the National Pulse Program at Ishurdi and the other the PSO in-charge at Hathazari. Neither of these were trained by the IDA or ARP-II projects. The ARP-II Supplement may want to require that such trained personnel spend at least 2 years or so at a Regional Station on their return.

2. - There is a second advanced degree track for older, experienced PSO's (those over 35 years of age who are not allowed to receive out of country advanced degree fellowships). Many of these officers are out at the Regional Stations. The ARP-II has provided funding for in-country degree training at the Bangladesh Agricultural University. Examples are the PSO in-charge at Ishurdi RARS who is completing Ph.D. work with a thesis on legume-based cropping systems. In addition, the PSO of Wheat at Jamalpur is completing a thesis on more efficient production with late planting of wheat. There are now 40 or so such advanced degree students. In the opinion of some Associate Production Agronomists, this is a useful strategy because it often rejuvenates research scientists who are placed at the RARS and who will have limited access to higher posts and to advanced education opportunities abroad. These scientists could have 15 more years of productive work if provided with training and support. In addition, ARP-II has provided research support funds for some of the Ph.D. students to go to India or Thailand for short-term (3 month) literature review or other thesis preparation work. There are persuasive arguments for the ARP-II Supplement to continue to support these types of in-country advanced degrees as long as it does not create too many absences at the Regional Stations. However, most researchers and TA staff argue that it is preferable for those under 35 years to go out of country for advanced degrees to be exposed to new ideas and new systems of work.

3. - In Tables 7 and 14 we see that under both ARP-I and ARP-II a total o. 13 BRRI researchers and 16 researchers from other institutes received foreign Ph.D. fellowships. Tables 8 and 15 indicate that 31 BRRI researchers and 26 researchers from other institutes received M.S. fellowships. This is a small number compared to such AID support provided for agricultural research systems in Thailand and other countries. And BRRI, due to separate funding arrangements, received a disproportionate share of these advanced degrees. Also, in our regional field visits we did not find any of these returned foreign degree researchers. They are concentrated at research institute headquarters and at BARC. Short-term overseas training funded by ARP-II for all institutes (excluding BRRI data is given in Tables 9 through 13.

We did find that the regional stations required more expertise (whether in training for current staff or new officers) in Horticulture, Pest Management, Research Farm Management, Agricultural Economics, PC Computer Software for Data Management and Analysis Systems, Report Preparation, Use and Repair of Laboratory Scientific Equipment, Repair of Farm Machinery, Water Management, Farming Systems, Livestock, Agroforestry and Fisheries. Also, the regional stations and FSR sites had not begun to think about focussing on technologies that could improve the farm productivity of rural Bangladeshi women and methods of involving these women in homestead research.

ARP-II could address some of these regional station and FSR site needs through earmarked short-term or long-term training out of the country, in-country training, and long and short term TA support specifically geared to the RARS and FSR sites. One specific suggestion by an APA was that regional station heads need observation and training study tours to international research institutes (e.g., ICRISAT) or a special USDA Management Training Course for Station Managers. BARC and the research institutes could address some of these station needs by insuring that returning advanced degree holders go out more frequently to regional stations not only for quick visits but for substantive supervision and training of researchers.

3. - ARP-II provided a substantial amount of in-country training by TA personnel. Of the 50 field research officers interviewed, 8 (16%) said they had received some short term training (in-country or foreign) through this project. More in-country training was planned by the TA staff but the MOA decided not to approve some of it. When BARI OFRD was planning to use ARP-II training funds for some training sessions, it found that the process of approval through BARC and the MOA was so difficult and convoluted that it could never conduct such training. The CSO decided to use FAO money for all training because there was more flexibility and quicker approval. Several TA specialists and Bangladeshi scientists argued that USAID should retain approval authority for training or give the authority to the contractor. They emphasized that if the training funds are given to BARC, the MOA will have final approval or delaying authority.

4. As noted above, the in-country training that was the most effective for the regional stations was the day-to-day support and dialogue on the research process provided by the Associate Production Agronomists residing there. They aided the OFRD officers and those interested officers from other Divisions in: relevant research planning, experimental designs, timely and scientific implementation of field trials, analysis of data,

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development of clear conclusions in interpretation of data, research report writing, and good report presentation. They helped organize seminars and Internal Research Review Workshops. They also facilitated the development of better contacts with extension officers and farmers. This technical assistance was especially important at this early stage of development of the RARS, CSR/FSR sites, MLT Program, and Pilot Production Program. During this time, the stations were understaffed with no appointed and exerienced CSO to assume these responsibilities. The over-worked PSO's in-charge could give some of these research process training responsibilities to the experienced resident APAs. The APA's spent about 60- 75% of their time working with the OFRD staff and programs and 40-25% of their time with staff from other Divisions. In Tables 16 and 17 the opinions of station heads and station scientists about the usefulness of the APA and a few other TA specialists who worked at their stations are provided.

This kind of in-service training over a longer period of time is essential for learning the complex skills required for good agricultural research. The ARP-II Supplement should see that this type of training continues for the RARS and especially is available for the Hathazari station which did not receive such TA assistance in the latter part of the ARP-II project. It remains to be seen how many of these research activities are continued after the loss of the resident APAs and with disruption of trained teams by transfers.

The APA and the Production Agronomist working with the OFRD at BARI HQ also trained FSR and MLT field assistants in such skills as laying out plots and experiments, calculating fertilizer doses, collecting plant and soil samples, and measuring yields during crop cuts. In our visits to the sites we were able to see many of these skills demonstrated.

Other Winrock TA Specialists who were specifically mentioned as visiting some RARS or BAU and training or arranging training for the researchers there were the following: Ed Perdon (Production Agronomist at OFRD HQ), Roger Lazaro and Carlos Garces (Water Management located at BARI HQ), Sam Portch (Soils located at BARI HQ), and Brook Greene (Agricultural Economist located at BARC), and Hugo Manzano (Farming Systems located at BARC). Some TA Specialists assigned to BARC, BARI, or BRRI were not assigned by their counterparts to work with researchers at regional stations and were assigned specific functions only at HQ. In other cases, the TA Specialists preferred not to make difficult trips to the hinterlands. In the past experience of this project the TA Specialists most willing to live or work for long periods out in regional areas are expatriates from other developing countries or Americans with a definite field or Peace Corps type of orientation. For the Supplement, terms of reference should be written for most TA Specialists that would guarantee their access to and their actual work effort in regional research programs.

5. - The ARP-II project funded advanced academic training abroad for only 1 woman out of the 21 total trained from all institutes except BRRI. One woman researcher received a Ph.D. in Pest Management and six attended short-term training (see Table 18). USAID/Bangladesh is more concerned than in the past that professional women in the agricultural research system and other areas receive more good training opportunities. Achieving this will require some effort on the part of the managers of the Supplement project and BARC. As in other USAID projects, it may be useful to emphasize

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this objective by earmarking some training funds. USAID has provided support in a separate project for 2 women to obtain Ph.D.s and 3 to obtain M.S. degrees in rural sociology. As these women return, there should be efforts made by USAID and BARC to capture their expertise by supporting a Women's Agricultural Research and Training Cell which will address research and outreach issues such as the improvement of farm productivity of rural women.

6. - A major reason for any training effort is that Bangladesh Agricultural University (BAU) is not turning out graduates fully prepared for working in the changing and demanding agricultural research system. The BAU faculty member on our Team noted that neither he nor most of his colleagues have been able to visit the field stations and new FSR and MLT sites. Part of this isolation is due to lack of funds and another part is due perhaps to a competitive attitude or estrangement between BAU and the research institutes. USAID is currently examining the possibilities of funding curriculum development activities and providing other support to BAU. USAID is currently funding such activities at the Institute for Post-Graduate Studies in Agriculture (IPSA). Certainly donor support is needed and some institutional bridges need to be built if BAU is going to provide education to meet manpower needs of the agricultural research and extension system. This support should also aid in the development of post-graduate teaching (M.S. and Ph.D.) programs at BAU.

SECTION 4 RESEARCH COLLABORATION

4.1 INTRA-INSTITUTIONAL COLLABORATION

1. - Infrequent Substantive Field Visits from BARI HQ Senior Scientists. As mentioned above, all of the returned advanced degree holders whose advanced education was supported by the ARP-II project have been posted to BARC, BARI HQ, and BRRI HQ. Outside of the OFRD at BARI, scientific officers at BARI regional stations reported that there were minimal on-site visits, support, and supervision from the BARI HQ senior scientists. There are regular Research Review Meetings at BARI HQ (at least for OFRD and some other Divisions) but very few on-site visits with substantive discussions of research issues and research support problems. While the TA Associate Production Agronomists and Production Agronomist were funded by ARP-II, they carried out much of this on-site facilitation of research design, implementation support, and on-site analysis and interpretation of trial results. This was particularly so for the OFRD research and somewhat for the research in other Divisions. The question now remains whether twice yearly Research Reviews at HQ provide sufficient research dialogues and assistance to the regional station staff.

2. - Insufficient Interaction Between Divisions or Discipline Scientists at the BARS. The three Associate Production Agronomists all noted that they had tried to encourage research scientists from all represented Divisions at the regional stations to analyze and write up their trial results for presentation at the Internal Review Workshops (which included extension officers in the region) and at station seminars. The OFRD officers were involved because of a HQ directive requiring their involvement, but there was not much encouragement from senior officers in other Divisions at HQ. The degree of participation in this kind of regional sharing of research

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conclusions, evaluation of the research, and planning future research depends on the inclinations of the regional scientists and the directives from their Chief Scientific Officers at HQ. If much of the research program of a particular Division is designed by HQ senior scientists and results tend to be analyzed and interpreted at HQ, then there may be less motivation and pay off for regional station officers to participate in this dialogue. Coordinated or integrated research efforts are needed across disciplines at the regional stations to evaluate varieties, technologies, or cropping patterns.

Also, this interaction depends on the attitude of the station PSO in-charge, whether he encourages all scientific officers to participate in the Internal Workshops and in Regional and District Technical Committee meetings with the Extension personnel. Finally, this type of regional dialogue partially depends on the experience and substantial support of a long-term TA specialist like the Associate Production Agronomist. We found more interaction at Jessore, Ishurdi, and somewhat at Jamalpur. It remains to be seen whether the limited cooperation will continue now that the Associate Production Agronomists have left.

3. - Need for Collaboration in Some On-Farm Trials. Some OFRD researchers pointed out the heavy on-farm trial workload on them compared to the lesser workload of researchers of other Divisions. One factor is that the researchers are planning, implementing, and analyzing results from research trials for three seasons each year at the FSR and MLT sites. In contrast, the Wheat Program or Pulse Program scientists are working on one season's trials each year. In addition, the OFRD scientists are conducting two types of trials at the FSR and MLT sites: 1) the OFRD cropping system / farming system trials and 2) Advanced Technology Trials which are designed by many other Divisions and then assigned to the OFRD officers for on-farm field trials. One reason for this is that OFRD has the fieldmen to implement these trials. Another problem is that although the OFRD officers are general agriculturalists experienced in on-farm trials, cropping systems and dialogues with farmers and extension officers, they do not always have the specialist expertise required to plan, implement, and interpret field trials with specific crops, soil, or other components. Collaboration between officers from other Divisions and OFRD officers at a station would improve the quality of the on-farm trials and the analysis of data and relieve some of the workload of the OFRD officers.

4. - Lack of Collaboration Between the BARI Horticulture Division and the OFRD Division at FSR sites. All RARS and FSR sites are interested in developing vegetable and fruit production research because of local farmer interest in these. Several such programs have been held up because of bureaucratic arguments at HQ between these Divisions. OFRD has the field staff but not always the expertise to conduct such trials. Horticulture has some expertise but has assigned very few staff to regional stations and none at all to FSR sites. This lack of a collaborative effort has seriously delayed some vegetable production components of the FSR program.

4.2 INTER-INSTITUTIONAL RESEARCH LINKAGES

Most research stations are functioning in an isolated fashion in terms of use of research resources and research planning and evaluation. Often

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this may be due to lack of transportation resources to visit other agricultural research stations or institutions. However, it is also due to bureaucratic separation or personal rivalries emanating from HQ or Ministry administrative units. Some cases of linkage that were locally developed were:

- BARI's Jamalpur OFRD officers tapping into the expertise of the BAU Department of Animal Science. They needed this expertise to initiate some FSR site on-farm trials on urea-treated straw for feeding cattle. These inter-institutional contacts were initiated by the Associate Production Agronomist Vignarajah.

- BAU's FSR Program is supervised by an interdisciplinary Task Force involving scientists from a number of university disciplines and alumni who are now working for the Fisheries Research Institute and the Bangladesh Livestock Research Institute. This FSR research network is based on good local faculty-alumnus relationships.

- A third example of such linkages are the RARS officers who are working on advanced degrees at BAU. They are forming useful research contacts with their advisors and faculty committee.

One of the main problems with development of the Farming Systems Program in Bangladesh has been the difficulty in working out the joint research arrangements between different bureaucratic units (e.g., BARI and Bangladesh Livestock Research Institute and BARC Member-Director for Livestock). These discussions have been carried out at senior levels in the National Farming Systems Working Group and the National Technical Coordinating Committee for the Farming Systems Research Program with no notable success. From our discussions with officers in the field and at various research institutes outside of the Dhaka area, we found greater interest in joint research strategies and in sharing of findings and lessons learned from past research efforts. For instance, OFRD scientists at Jamalpur were interested in meeting with FSR Program researchers from BAU and BJRI who are working in the same region. Farming System researchers at most sites were interested in joint discussions and visits to other sites.

As noted above, the BAU faculty and students have been somewhat isolated from visits and joint research efforts with other institutions of the agricultural research system. This is due to shortage of funds, lack of effort in establishing such linkages, and perhaps some institutional and personal rivalries. This separateness undercuts the success of the University in identifying and meeting specific manpower needs of the research system and results in wasteful duplications in research using limited resources. One example of the kind of beneficial linkage that could be formed is the assignment of BAU graduate students to particular regional stations to work in a focussed way on particular thesis research problems. These students could have a joint faculty and regional station thesis advisory committee.

The commencement of the National FSR Programme and the attempt to define what this means in particular FSR site research has emphasized the critical need for inter-institutional linkages and sharing of expertise. Only the BAU FSR Program has been able to develop a true interdisciplinary

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focus because of the ease of establishing an interdisciplinary task force within the University and within faculty - alumni networks. Researchers working at other FSR sites in particular regions or agro-environments want to discuss their work with others working in the same area. Most sites with agricultural researchers require the collaborative expertise of forestry experts for agroforestry projects, fisheries experts, livestock experts, water management experts and other specialities. On the other hand, the Bangladesh Forestry Research Institute, for example, requires some agricultural assistance in establishing their new FSR site research programs. In our discussions with scientists at that institute, they expressed their willingness to collaborate with other FSR sites if necessary travel funds could be provided and if they are not bureaucratically restricted by the Forestry Department from such collaboration. Certainly BFRI and Hathazari RARS, which are located within 15 miles of each other, should carry out collaborative research. In our discussions with these two institutions, the issues of funds for travel and research and invitations were mentioned. The PL-480 funds provided by USAID will support such travel between research institutes, but the institutes must be interested in such inter-institutional collaboration before it will occur.

Apparently, higher level officers at the various Departments, Ministries, and BARC have not been able to agree on collaborative research arrangements at the FSR sites. This has caused major delays in the transformation of CSR programs to FSR programs and in the establisment of new FSR sites. The APAs at both Jamalpur and Ishurdi RARS waited for two years for livestock researchers to join the FSR site programs as planned. Finally, Jamalpur made their own contact with a BAU scientist, and the Ishurdi livestock component was dropped. Now that the APAs have finished their contracts, some livestock researchers have been assigned to BARI FSR sites. Strong BARC leadership is needed to encourage and coordinate effective inter-institutional collaborative research programs.

SECTION 5 RESEARCH FUNDING AND SUPPORT SERVICES

5.1 FUNDING

In Tables 19 and 20 and Appendix 3 USAID funding of CSR/FSR sites and regional stations is outlined. ARP-II has supported: long and short-term TA at the regional stations, in-country and out-of-country training for researchers, research equipment, salaries for selected FSR site contract staff, and contract research funds. USAID has also provided PL 480 Funds since 1983-84 for operating funds for research institutes and research stations. There have always been long delays in receiving Contract Research Funds which seriously interfered with timely implementation of research trials. Our team visited in the fourth quarter of the fiscal year. At that time, second and third quarter funds had not yet been received by the RARS. This is due to lengthy accounting procedures at BARI HQ, BARC, and USAID. Consequently, some research is started late; some is dropped; and some money is borrowed from other funds. This is a critical issue in terms of quality and quantity of regional research. Some PSOs in-charge suggested that the funds should be transferred directly from BARC to the RARS for timely arrival of funds.

Institute and station researchers uniformly praised the timeliness and availability of PL 480 funds for research operating expenses. These funds along with some critical TA staff and some training have probably had the largest impact on the quantity and quality of regional research and on researcher contacts with farmers and extension officers.

5.2 RARS LAND RESOURCES

Most of the stations have sufficient land for their research program. Hathazari RARS has an extremely varied land resource with ponds, land of varying elevations. diverse types of fruit orchards, and spice stock planted in Pakistan times. Because of this, this RARS has the greatest possibilities for doing many types of FSR research on station. However, this station is underutilized for research purposes because of insufficient staff, research and TA support. Jessore RARS has a land scarcity problem (50 acres of 75 acres for field trials) since it lost 50% of its land to the cantonment. This station will have to rely on on-farm trials, whether of leased land or voluntary farmer trials. With less fertile land and no guaranteed irrigation on seasonally leased land, there is not much scope for breeding programs. For fertilizer trials, they will have to take longer term leases. Jamalpur RARS requires some drainage facilities for timely Rabi cropping trials.

5.3 EQUIPMENT AND TRANSPORT

The Ishurdi RARS, the only one built by USAID during ARP-I, has separate laboratories for different Divisions and the laboratories are more or less well equipped. In fact, the laboratories are better designed and better equipped than at any other RARS (See List of articles/equipment received under ARP-II). Most other stations visited, except for the Sugarcane Research and Training Institute, had much less equipment and poor laboratory arrangements with one undivided room rather than divided spaces for researchers. These labs need modification.

There appears to be little BARI or BRRI expertise in setting up new research equipment and adjusting and repairing equipment. Some of the Associate Production Agronomists noted that they had often uncrated equipment, adjusted it if they could and plugged it in, and trained some researchers to use it (e.g., even simple equipment such as balances, water distillers, and seed germinators). Dr. Mallik noted that other short-term TA Specialists came to Ishurdi to adjust and fix some equipment (e.g.,Mattick and Khamacho,a Horticulturalist). In addition, Winrock hired a Bangladeshi mechanic to visit regional stations and fix some items such as deep freezes (e.g., set up the right voltage and the right plug). A few researchers who have studied at international research institutes (e.g., CIMMYT or ICRISAT) have learned some of the necessary equipment skills. However, many professional Bangladeshis do not want to learn or practice manual skills because of cultural perceptions about status and manual labor.

There are a limited number of PC computers in the agricultural research system, mainly at BARC with a few at research institute HQs. For researchers at regional stations to use these for data input and analysis

would require that they travel to Dhaka or Joydepur for a few days and have access to them. If field researchers are to analyze their own experimental data and produce their own reports rather than sending the data to HQ for these functions, some PCs are needed at the regional stations. This would require some training in the use and care of these machines. However, there is a developing computer service sector in Bangladesh which is gaining experience with training in software and maintenance and repair of machines. Organizations such as CARE are already using computers in their branch offices. The proper introduction of PC computers and software to regional stations could introduce some research excitement for scientists located in those areas.

Practically all of the research station scientists talked about inadequate transport for research and linkage functions. A station wagon/jeep was available under scheduling of the PSO in-charge. The Associate Production Agronomists provided badly needed transport for CSR/FSR, MLT, and PPP research activities. Also, his jeep was used to carry RARS officers to meetings with extension officers and farmers. The OFRD officers had a few motorcycles for FSR, MLT, and PPP research activities. The combined transport is inadequate considering the area for which the regional researchers are responsible and the contacts with farmers and extension staff they are expected to make.

5.4 SOIL AND PLANT ANALYSIS

ARP-II funded the establishment of a modern Soil Plant Analysis Lab in the BARI Soil Chemistry Division at HQ with micronutrient analysis capacity. There are four Soil Analytical Service Division (SASD) in Dhaka, Comilla, Rajshahi, and Khulna. These labs have less sophisticated equipment and cannot do micro-element analysis. Many of the RARS researchers noted that they had sent soil samples, but never plant samples, to BARI HQ and still had no results a few months later. When we checked with the Winrock Soil Specialist and the CSO of the new Soil Lab, they told us they were able to process samples within a three day turn-around. They suggested that perhaps there was some routing confusion because of the two labs. Initially OFRD sent samples to the SASD lab because many OFRD staff originally came from the SASD. However, OFRD is now beginning to send its soil samples to the Soil Chemistry Lab. The Soil Lab will become more useful to the researchers, extension staff, and farmers in the regional areas only when: 1)these target groups learn how to properly prepare soil and plant samples and interpret the results and 2) when reliable and timely routing of regional station samples and results are established. This will require training for all groups involved. In addition, the SASD Labs need to have a well-defined but narrower role in the regional systems. At this point, they are underutilized.

SECTION 6 REGIONAL STATION RESEARCH PROGRAMS

6.1 VARIETAL DEVELOPMENT AND SPREAD

Table 21 provides a list of varieties developed by Bangladeshi scientists and approved by the National Seed Board. The majority of the

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varieties have not reached farmers for production. Breeders take the responsibility for developing the varieties and getting the approval for release by the National Seed Board. Because of early emphasis on crop breeding in the agricultural research system, several scientists received good foreign degree training in this field. Consequently, there are now many specialists in several research institutes (BRRI, BARI, BINA, BAU, BJRI, and SRTI) working on developing new varieties, especially in cereals, pulses, and oil crops. The bottlenecks are located at these points: 1) station and on-farm testing of these new varieties; 2) seed production and distribution to farmers; and transfer of associated technology to extension workers and farmers. There is stiff competition at the first two points because of limited research station land and field researcher staff and because of a public sector monopoly on seed production and distribution (BADC, BARI and BJRI). Also, the Bangladeshi member of our Appraisal Team who has experience in this area noted that breeders don't take the responsibility of linking up with seed producing agencies and persuading them to multiply seed from their variety and distribute it. At this time, there are no private sector companies involved in this area.

There have been few studies about the adoption of varieties. A consultant for BRRI and BARC has just completed a large survey report on the adoption of rice varieties. This report has not yet been released, but our team was able to look at a summary of findings (see list of main points in Appendix 4).

The National Seed Board has recently approved 139 varieties of 38 vegetable crops from those local and exotic varieties commonly cultivated with better performance. The approved exotic varieties are the only ones that can be imported legally by traders. BARI is the research institute mainly responsible for development of varieties of these vegetable crops, and BADC has the responsibility of multiplying and distributing the seeds. BARI is attempting to develop varieties which will produce seeds under prevailing Bangladeshi agro-ecological conditions to reduce the loss of foreign exchange in purchasing these seeds abroad and to bring the seed cost within the purchasing capacity of small farmers. Some successes have been the Provati cabbage variety, the Tasaki-San radish variety and a water-melon hybrid variety.

At the regional stations and other sites station trials and on-farm trials are being conducted on the crops and varieties listed in Table 22. At this point of limited seed production and distribution of these new crop varieties, the main distribution points of information and seeds to farmers are the RARS trials and on-farm trials at the CSR/FSR, MLT and PPP sites. Researchers are passing information about these crop varieties to extension officers at regional and district meetings but the extension Block Supervisors do not usually have the seeds to pass out to farmers in their area. There are some Upazila (subdistrict) nurseries run by extension officers which may be providing seeds and seedlings in a limited way.

All research stations are conducting trials with Bati sak and China sak leafy vegetables and Tasaki-san radish varieties, SS-75 mustard, pulse varieties (developed in the Ishurdi Pulse Program), several new wheat varieties (e.g., Sonalika and Kanchan) developed in the Jessore wheat breeding program, Cardinal variety of potato, and new rice varieties. Other research crops are listed in Table 22.

6.2 SOIL FERTILITY RESEARCH

Up to this point fertilizer recommendations have been for individual crops and for optimal production. The regional stations are beginning to think about and/or conduct trials on residual fertilizer effects and more efficient and lower fertilizer applications for total cropping patterns. Four years ago, Mallick, who was then an APA at Hathazari station, initiated some work on residual fertilizer effects on an upland cropping pattern at the CSR site. However, these studies have not been continued since he and certain OFRD scientists transferred to other locations. More recently he worked with the OFRD researchers at Bogra and Rangpur FSR sites looking at the effects of fertilizer doses applied to wheat on succeeding T. Aus and T. Aman crops. They were specifically looking at the carryover of P, K, Zn, and SO4. Jamalpur and Jessore are talking about cropping pattern-based fertilizer recommendations but no one has yet started work on this. BRRI has been conducting this type of research since 1985. A few years ago there were some trials with urea supergranules; however,there has been very little continuity in this research. Whether BARI regional stations and FSR sites will continue these types of soil fertility research with the APAs no longer working with them is uncertain.

Also, research trials seldom measure yield responses to fertilizer doses in the range between optimal doses and farmers" traditional input. There have been some studies at the Kalikapur (Ishurdi) and Laherikanda (Jamalpur) FSR sites which have looked at farmer fertilizer use and the effects of seasonal fertilizer prices on this usage.

There seem to be no field trial studies combining good soil sampling, field or plot use histories, and crop response studies. Also, there do not seem to be any recent trials comparing types and timing of fertilizer input. In addition, for irrigated crops there have been few studies on water use and fertilizer applications. BRRI has been doing some of this on-farm research with rice. The level of work suggests that TA support is needed in the Project Supplement for a soil fertility specialist(s) who will be active in the regional stations and FSR sites.

6.3 WATER MANAGEMENT RESEARCH

During the time of the ARP-II project and mainly due to the project Specialists and consultants and some contract research, a field of research has been defined in some detail where there was little research before in Bangladesh. A number of issues have been researched, technical and socio-economic problems defined, and many recommendations provided. The Water Management Specialists had to seek out and recruit clients for their expert services and attempt to pull together a community of interest (e.g., a research network and a policy network) for this topic from some very diverse locations.

They leave some better informed scientists with some research agenda for the next few years (see large number of consultants' recommendations), an institutionalized unit at BARI (Water Management Division) and a couple of BAU faculty members who are interested in updating the curriculum to train water management engineers. These faculty also felt they learned a lot during their contract research, both about technical and socio-economic organization of irrigation systems. The two Command Area Irrigation

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Projects that produced the best research results were the BAU project and a project near BARI HQ. The BAU project found that command areas and Boro rice yields could be increased by improving pump efficiencies, canal alignments, and more efficient block distribution systems.

The projects at the regional stations (e.g., Hathazari) never really got off the ground because either there was no water management engineer posted to the station or his services were appropriated for repair of station equipment. Water Management issues have not been integrated into the CSR/FSR site research. This may not be possible unless more water management engineers can be adequately trained and hired to join these sites.

6.4 PLANT PATHOLOGY AND ENTOMOLOGY RESEARCH

The team found little evidence of pest management research at the regional stations visited. Also, there was not much expertise available. There were some on-station and on-farm chickpea varietal trials and banana varietal trials at Jessore station examining Fusarium resistance. Both of these types of trials were addressing some key farmer problems in that region. Other than those cases, we did not see specific research trials dealing with disease resistance issues. Most of the TA work in Pest Management supported by ARP-II was carried out at BARI HQ. There was much work to be done. Because of bureaucratic problems, mainly planning and not implementation of plans was accomplished. Researchers at the RARS and FSR sites realize that they need some staff with expertise in these areas because farmers are keen to get some help with these problems. The ARP-II Supplement should address these regional station and FSR site needs in some fashion.

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SECTION 7 CSR/FSR PROGRAM AND TECHNOLOGY TRANSFER

7.1 CSR/FSR PROGRAM IN GENERAL

Table 19 lists the CSR/FSR sites under each research institute, the funding agency (USAID and/or IDA), and the date initiated. There were 7 USAID funded CSR sites with activities starting in the period 1980-82 and ending in the period 1985-86. With the transformation of the CSR Program into the FSR Program in 1985-86, USAID is funding 6 FSR sites for a three year period. The budget listed for the FSR sites on this TAble includes funds for contracted staff, contract research funds, and a few motorcycles.

In previous sections of this report we have discussed various aspects of these programs. We noted the importance of this program in furthering the process of regionalizing agricultural research in Bangladesh by: initiating dialogues with farmers and extension workers, conducting on-farm trials, and building up an information base about agricultural production in local areas. In a short time (3-5 years) a number of researchers (particularly those in CSR research) began to think in terms of cropping patterns rather than single crop research. They also began to think in terms of cropping patterns for specific agronomic areas such as irrigated areas, rainfed lowland areas, and rainfed medium to highland areas. Also, the amount of research conducted in various regions increased five or six times. One example is at the BARI Jessore RARS. In 1980-81 there were 36 research projects, in 1983-84 66 projects, and in 1986-87 192 projects. Much of this was due to the development of the OFRD field-emphasis unit at BARI. However, the increase in quantity of research as well as quality of research was also due to the work of the long-term Associate Production Agronomist funded by ARP-II. However, such TA support was only provided for a few stations.

A major problem with the program discussed above was the heavy year-round work-load of the OFRD generalists and the lack of collaboration with crop or component research specialists in other Divisions. The quality of the CSR/FSR research trials and analyses undoubtedly suffered because there was little input from experienced crop or component specialists. There were also other research program problems discussed above which need not be repeated here.

In 1985, the OFRD began training its staff to conduct Multilocation Testing of several cropping patterns developed in the 3-5 years of the CSR Program. Some of the sites and cropping patterns are listed in Table 23. The benefits of this program are that it tested certain patterns under diverse cropping conditions and provided more points of researcher contact with farmers and extension workers. It provided more farmer access to new technological ideas and to seed of new crops and of newer varieties of various crops. However, the impacts have been localized to a few farmers involved in the trials or near-by neighbors.

In 1986-87, the OFRD began the third planned program -- Pilot Production Programs. This effort at enlarging the number of farmers involved in production of tested cropping patterns has barely gotten off the ground at this point. Through great efforts by the APA and OFRD staff at Jamalpur, one fairly successful PPP was started at one location

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overlapping with the FSR site. The program at Hathazari has not been as successful, partially due to the fact there was no APA to assist in implementing it. The logistics involved in this type of program (e.g., getting the proper seed in large amounts at the proper time and distributing it) are daunting to an OFRD staff already stretched thinly over an expanding number of FSR and MLT sites. In addition, there is the effort needed to motivate farmers to take the production risk. The expectation for both the MLT and PPP programs was that there would be OFRD field assistants involved and DAE Upazila Extension Officers with only minor assistance by the OFRD researchers. In fact, the burden is still on the OFRD scientists and field assistants.

The quality of research work has been higher at some of the BARI CSR/FSR sites and the BAU sites. Reasons for this at BARI is that there is energetic and well-informed HQ leadership with a large field staff and significant staff training efforts. Also, ARP-II provided four TA long-term specialists (3 Associate Production Agronomists at the RARS and a Production Agronomist at HQ working on MLT and PPP planning and staff training courses). At BAU there is also an active and well-informed Coordinator of the CSR/FSR program, some very good site coordinators and other staff who provided team continuity (no post transfers in this small program) over a few years for the research efforts, and available faculty expertise. There have been several reports produced by researchers at the USAID-funded Kalikapur site (see Appendix 5), the model BARI CSR/FSR site outside of Ishurdi, and by researchers at the IDA-funded Trishal Thana site, the original BAU CSR/FSR site.

The Kalikapur site operated as a de facto in-service training site for a couple of years when Mallick was working with 9 young researchers, both OFRD and contract researchers. Now, some of these have been dispersed to become site coordinators at other sites (including a BJRI FSR site). Both the Kalikapur site and the BAU FSR sites could usefully become training sites for FSR research if there continued to be good supervision and support. This is particularly important for new staff being hired for the FSR sites that are just being established. Many of the research institutes less experienced in CSR/FSR site work (e.g., BJRI, BRRI, SRTI, BLRI, and FRI) could get their site research programs established more quickly if their new recruits received 2-3 month internship training at some model or demonstration sites. Such demonstration sites could be developed at the BAU or Kalikapur sites. There could also be useful follow-up inter-site discussions between more experienced and less experienced researchers. However, for this to occur there is the ever-present problem of completing inter-institutional arrangements. This is an area in which BARC should act as a facilitator and provide some training funds.

7.2 EXAMPLES OF OFRD CROPPING SYSTEM RESEARCH

Table 22 lists types of improved technologies that each regional station noted during our visits. Some of these involve varieties or technologies that were being used in CSR on-farm research.

The CSR work at Kalikapur began to demonstrate a real dialogue with farmers about their evaluation of suggested "improved cropping patterns." This farmer point of view was collected in the 85-86 and 86-87 seasons and

added to the most recent research reports. Some of the cropping pattern research is listed below. It demonstrates some of the trade-off decisions farmers will have to make in agricultural production.

1. - The farmer cropping pattern for medium highlands has been B.Aus-T.Aman-Wheat. Problems have been caused by the rainfall pattern: low rainfall in the early Aus season, a 95% probability of rain in June and a high probability of low rainfall in July--August. The main problem has been a failure of the T.Aman crop when there is too little rainfall in July-August. Also, there has been high soil nutrient depletion with the three cereal crops. Researchers tested a pattern which would allow an early T. Aman planting (1 month earlier). This was Summer Mungbean-T.Aman-Wheat. However, the farmers noted harvest problems with the mungbeans: pods do not mature at the same time and under humid conditions if they are not harvested quickly, they may germinate. However, the T.Aman yields were higher.

2.- For the medium and highland areas, the traditional pattern has been B.Aus- fallow-wheat. The problem for farmers has been frequent moisture stress for B.Aus rice at the vegetative and panicle initiation stages resulting in low yields of 2-3 tons/ha. Researchers tested the following pattern: Maize with mungbeans intercropped- fallow- wheat. Although the maize is relative drought resistant and gave a 733% higher grain yield than B.Aus rice, it was damaged by heavy rain prior to harvest. Also, the return to material cost was higher for the improved pattern. The farmers responded that the maize involved too much fertilizer; maize had to be planted near the household so it could be watched and not stolen; the mungbean harvest disturbed the maize plants; and they preferred sole maize because it was difficult to sidedress N with the intercropped mungbeans.

3. - Researchers began to introduce Kanchan variety of wheat in the patterns in place of the earlier improved variety Sonalika. There is a higher benefit-cost ratio but BADC does not yet have available seed for farmers that are interested in this variety.

4. - For rainfed highland areas, one traditional pattern was B.Aus(Loc)-fallow-fallow or lentils/Mustard(Loc). The researchers tested the pattern B.Aus(Loc)-fallow(or short duration mungbean)-Mustard(SS-75). Their findings were that SS-75 Mustard gives almost double the yields of the farmers' variety (Tori-7). However, SS-75 requires sufficient moisture at the time of planting and higher fertilizer inputs to produce high yields. Also, SS-75 is more susceptible to infection. The farmers did not like the high fertilizer requirements of SS-75, and they found that this higher use contributed to lodging in the B.Aus rice. Also, on rainfed land in years of low rainfall or on land with unreliable irrigation, SS-75 gave a low yield. Also, farmers prefer intercropped lentils+mustard, and there was a higher benefit-cost ratio with the combination. Lentils provide a good fodder by-product.

5. - Researchers tested sunflowers as an oil and by-product crop to be grown in the winter season as an alternative rainfed (i.e., non-irrigated) pattern crop when there is not enough rainfall for wheat production. This is an example of a type of short-term alternative strategy farmers could fall back to in a year when there are less than optimal conditions for the preferred crop. Local farmers are interested but there are problems:

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obtaining seed, knowing how to process the seeds for oil, and development of a market for the unfamiliar oil and the byproducts. Also, there is a problem of insufficient bee populations due to insecticide use. Ishurdi RARs researchers are looking at hand pollination methods.

Example of Jamalpur CSR research:

1. - Researchers were looking at new and old char areas where a rabi crop can be grown. They were testing several groundnut varieties and an improved sweet potato variety that has an earlier harvest. This variety has a better market price because it is earlier and gives higher yields but it has storage problems and is not preferred for cooking. This variety does not have the support of the station researchers and scientists.

7.3 RESEARCH LINKAGES TO EXTENSION AND FARMERS

7.3.1 Research Linkages to Extension

The ERP Project funded by IDA and the ARP-II and PL 480 funding have improved research - extension linkages. Regular meetings have been institutionalized between the two in the last 3 - 5 years (depending on location). Regional Technical Committee (RTC) meetings are held prior to each of the three cropping seasons. The participants are higher level regional officers (see Organogram of the Department of Agricultural Extension --DAE-- field positions) in each, including the Subject Matter Specialists (SMS) of Extension (from each district) and key research officers from each regional station. They meet to discuss general research and extension issues for the region. Decisions are made about certain technologies that need to be emphasized by extension agents during the coming agricultural season, and farmer problems with the current season are discussed. The TA Associate Production Agronomists also attended these and were encouraged to give short presentations on topics of interest to those attending. There are also monthly research-extension workshops for SMSs which are less frequently attended than the RTC meetings. Finally, there are monthly District Technical Committee (DTC) meetings. At this type of meeting, current local farmer problems are discussed and district-wise "impact point" recommendations for farmers are developed by the researchers and extension officers. The SMSs and Upazila (subdistrict) Subject Matter Officers (SMOs) are then to train their Upazila Agriculture Officers (UAOs) who are to train the Block Supervisors (primary extension agents) in these impact points for presentation to farmers.

As expected, this system looks effective on paper. However, it is only partially implemented because of a number of constraints. The research officers do meet with extension personnel at RTC and some DTC meetings. There are too many districts in an agricultural research region for researchers to attend more than one or two district meetings in a month. Serious limitations of time, staff, and vehicles prevent more involvement by researchers in this system. There are a whole set of constraints on the extension side also. There are also staff and vehicle shortages. In addition, there is a breakdown in communication between the senior level officers who interact with the researchers at RTC and DTC meetings and the actual extension agents, the Block Supervisors. The chain of communication is too long for effective technology transfer. The

Upazila Agricultural Officers should be having dialogues directly with researchers to communicate farmers' needs more effectively and to learn what researchers know about useful agricultural technology. Also, there has been little training provided to those extension officers at the Upazila and Block Supervisor level.

A second set of constraints on the extension system has been the result of administrative reform or decentralization efforts in Bangladesh since 1983-84. The sub-district or Upazila level of government was established as the primary local government unit with an elected Chairman and Council (Upazila Parishad or UP). At the same time this unit was given block grants from the central government for organizing their own local development projects. Some of the central government functions were "transferred" to the Upazila governments, and the civil servants carrying out those functions are now "transferred" under the control of the Upazila Chairman and UP, although their salaries are paid centrally.

Development projects for these "transferred subjects" which were formerly funded by the central government as national-scale development projects, now can only be funded in a particular Upazila if the UP agrees to use its block grant funds for this purpose. In other USAID studies, it was found that UPs and Chairmen prefer to spend their money on rural works or infrastructure for several reasons. Very few are choosing to, for example, support agricultural demonstration trials in farmers' fields. This type of budgetary constraint on the Upazila Agricultural Officers and Block Supervisors has seriously undercut the momentum of previous efforts that were centrally funded. Farmers do not identify themselves as a political lobbying group and maybe would prefer roads and bridges to demonstration plots. However, in our discussions with farmers they mentioned former demonstration plots by extension agents in their areas in the late 1970s and early 1980s which were useful to them.

In some ways, the MLT and PPP programs by BARI and other programs by BRRI may be seen as partially covering the function of the former extension demonstration plots and other activities. However, these research activities are not as extensive and do not reach as many farmers. Part of the problem is that it was expected, at least by the research side, that the MLT and PPP programs would become mainly extension programs with the use of OFRD fieldmen and only some occasional assistance by the researchers. However, in fact, the OFRD staff is supplying most of the effort and production supplies of any MLTs or PPPs that are effectively operating. The DAE participation in these programs is limited by constraints such as shortages of Upazila extension staff and vehicles, lack of commitment to a program they perceive as researcher-initiated, and possibly tight control of their time and efforts by the Upazila Chairmen and UPs.

RARS and CSR/FSR site staff have made definite progress in their training of DAE staff and their encouragement of participation of extension officers and Block Supervisors at field days and crop cuts. The RRA team attended about five of these events and found several Block Supervisors and their cooperator farmers were attending them. There were times for questions and answers from both farmers and extension people. The PL 480 funds are critical support for the training and the field days. There are generally two to three field days or crop cuts for each RARS, substation,

and CSR/FSR site. Regional stations (particularly the OFRD) have also taken the initiative in inviting extension officers to Internal Research Reviews or Workshops twice a year. We discussed above the effort APAs provided in organizing these research evaluation and planning Workshops.

One additional means of communication with extension workers was the Extension and Research Bulletin initiated by Mallick and researchers at Ishurdi station. There have been 4 issues of this occasional publication. The first issue was about general topics and was in English. The others were in Bengali/English with the second issue also general in nature, the third focussing on seed processing, and the fourth on vegetable production. However, the red tape involved with BARI HQ clearance of each issue increased so that it took one year to clear the last issue. Finally, Ishurdi was allowed to continue if they mimeographed it instead of printing it. This last issue included a calendar for vegetable production (e.g.. what could be seeded, transplanted, harvested during each month) with recommended technologies. The extension people were very pleased with the Bulletin. BRRI communicates with extension workers through a Quarterly Bulletin and regular training courses, seminars, and annual review workshops. BRRI has had more opportunity to institutionalize its interaction with extension.

7.3.2 Researcher Linkages With Farmers

We have discussed above the on-farm trials at the CSR/FSR sites, the MLT sites, and the two PPP sites. Researchers are directly reaching a limited number of farmers within the site boundaries. Besides general technology, these farmers are getting access to seed from new crops or new varieties. In addition, researchers are directly reaching some farmers at fielddays and crop cuts. Many of these farmers are the same ones receiving the on-farm trials, but there are some additional ones from nearby areas brought by the Block Supervisors. However, these are limited numbers of farmers that have direct access to researcher expertise and research resources. There were estimates of from 100 to 200 farmers attending the RARS fielddays in a year. The regional station and CSR/FSR researchers explained that they could not invite more farmers to fielddays because it cost Tk 50 - 100 per farmer for food and transportation costs. There were not sufficient PL 480 funds to expand fieldday invitations. BRRI may be reaching more farmers through farmer training courses.

Some Ishurdi RARS wheat researchers created, with the APA's help, a slide presentation on storage of wheat seed to show farmers at district presentations.

The other part of the linkage is that through on-farm trials and various types of surveys, OFRD researchers, at least, are learning more about agricultural constraints and potential for farmers in particular locations.

The farmer interviews conducted by our RRA Team are summarized below in Section 8. In those interviews we attempted to get some indication of the types of researcher - farmer linkages and what benefits, if any, farmers think they have gotten out of these contacts. Also, we tried to see if there were any spread effects from the FSR sites to farmers immediately outside the FSR site boundaries.

7.4 EVIDENCE OF FARMER ADOPTION OF NEW TECHNOLOGIES

Farmer adoption of many new technologies depends on the expansion of irrigation (particularly reliable irrigation), the availability of good seed, unadulterated and accessible fertilizers and pesticides, the capacity to purchase these inputs, accessible markets, and knowledge about technologies and expected benefits. During the period of the ARP-II project, there has been a significant increase of irrigation acreage and improved access to private fertilizer outputs. The expansion of irrigated land and fertilizer sales increases suggest there is some capacity to purchase the inputs. There seem to be limitations in the availability of good seed except for certain HYV rice varieties. Also, there are a limited number of researcher to farmer contact points, and a partial breakdown of the flow of technological information to farmers through the DAE hierarchy. Given this picture, what evidence is there of farmer adoption of new technologies developed in the agricultural research system?

There have been few efforts in the agricultural research system to measure rates of adoption of new crop varieties, new cropping patterns, or new technologies. BARC and BRRI finally have completed a contracted national survey of 7457 farmers in terms of the use of HYV rice over the three cropping seasons. Varietal use was measured in terms of percent of production acreage and percent of total seasonal rice production. This project was discussed for 2-3 years before it was carried out in 1986-87. The draft report was completed during our RRA effort, but it has not yet been approved and released. We were able to see one summary section. Some of these summary points are given in Appendix 4. It is important to note that the figures of 48% farmer use of HYV for T. Aman and the 40% farmers use for Aus in surveyed areas are much higher than the 1985-86 Bangladesh Bureau of Statistics figures. The 86% farmer use of HYV for Boro in the surveyed areas was closer to BBS estimates.

No unit was clearly assigned the responsibility of monitoring farmer attitudes and adoption rates of new technology developed under the ARP-II and IDA projects. No one assumed this responsibility although the 1985 External Evaluation urged that this should be done during the last two years of the project. When we discussed this with the APA and the OFRD officers at the stations, they pointed out that for the last 3-4 years they had been busy trying to determine through on-farm trials if they had anything to offer the local farmers. They were also concentrating on developing a scientific research process. BARC or the institutes should take the responsibility for such monitoring efforts.

At Kalikapur there was a small study which indicated that after BR11 was introduced at the FSR site in a 100 square meter area in 1982, its use had spread to a total of 4.4 hectares in 1984. Also, at Kalikapur the researchers had noted but not measured the adoption of new wheat varieties and SS-75 mustard after they were introduced in the trials. At Jamalpur MLT sites the pattern of BR11 for T. Aman and Pajam for Boro was introduced in 1985-86 to replace a local variety used for Aman and IR8 used for Boro. The Pajam was yielding 15-20% more with the same fertilizer input. At the 1986-87 boro field day, the APA and researchers saw a "visible" increased adoption of Pajam. Jamalpur is planning to do an adoption survey on the adoption of mustard as a third crop with T. Aman and Boro at the Laherikanda FSR site. The APA thought there had been at least a 20%

adoption rate by site farmers since he had arrived in 1985. At Jessore there had been no monitoring of adoption, but the APA had visually estimated that more than 80% of the FSR fields had BR11 in the T. Aman season compared to very few fields when he arrived in 1981. Also, they introduced Binasai (earlier maturity than BR11) at the FSR site in 1984. This rice variety also requires low fertilizer input and has a high yield. Use of this variety means there is time for a third crop, a chick pea crop, before the winter crop. The researchers had visually noted an increase in the number of farmers following this pattern.

The Hathazari researchers introduced BR 11 through the CSR program in 1983. Now that the station has an economist, they plan an adoption study of BR 11. However, their visual estimation is that the area is now covered with this variety. Also, the pattern of maize intercropped with chilles and vegetables was introduced in the 1983-84 season while the APA was there. This combination is still planted in the area.

The RRA Team interviews with 120 farmers provide limited indications about adoption of new technologies and varieties. The findings from this survey are presented in Section 8.

7.5 PROBLEMS WITH TRANSFORMATION TO FSR PROGRAM

As the RRA Team visited the FSR sites and looked for evidence of FSR research, two points of view developed in the team. One point of view is that no significant research using this approach has been designed and conducted. This point of view is that because the concept lacks clarity it is difficult and maybe impossible to operationalize it at the FSR sites. In this view, continuing with separate component agricultural research may be more productive. The second view (that the glass is beginning to be filled) found a few examples, mainly initiated by APAs and by the BAU program, of non-field crop agricultural trials and concluded that researchers were beginning to think beyond cropping systems only. In this point of view, one main constraint on developing farming system research at sites is the complete lack of: intra-institutional collaboration (e.g., between Divisions in BARI) and of inter-institutional collaboration (between institutes and agencies responsible for crop production, livestock, fisheries, forestry, horticulture, etc.). Also, there has not been enough available expertise in agricultural economics and rural sociology at BARI amd BRRI to help conceptualize the FSR research.

The one research institution that has been able to move ahead with developing a conceptual framework for farming systems research and to begin to operationalize the interdisciplinary dialogue and cooperation required for doing such research has been BAU. The interdisciplinary Task Force supporting the FSR research there is pulled from various departments and from local alumnae networks in Government agencies. The key person who is conceptualizing the approach and organizing the on-farm research is Dr. Altaf Hossain, the Coordinator of the FSR program at BAU.

In contrast, the BARI FSR Program has gotten bogged down in bureaucratic non-cooperation at senior levels. Some of these sites have waited for two years for a livestock specialist to join the OFRD team. However, the necessary agreements have not yet been made by senior officers

in the relevant agencies. In addition, the Government has failed for two years to sign USAID's Homestead Agroforestry Project which would have provided funds for: training some OFRD officers in homestead agroforestry and training and research cooperation from the Bangladesh Forestry Researc Institute. In our discussions with BFRI, we found that they are eager to share their expertise with the agricultural research institutions but they have been linked very tightly with the Government Division of Forestry which refused to authorize this type of interdisciplinary cooperation. Now, BFRI is being placed under the control of the MOA rather than direct control by the Division of Forestry. They anticipate that they will have more latitude for such cooperation, but will require funds for this (e.g., travel etc.). Administrative units that have not cooperated well or at all in the past are being asked to cooperate in this endeavor. In the current national bureaucratic context it may be difficult or impossible to obtain their cooperation. BARC has not yet been able to achieve this through its National Coordinated Farming Systems Research Programme Working Group.

Alternative approaches are: BARI and BRRI researchers make informal contacts with BFRI and BAU researchers who have expertise in particular areas; the ARP-II Supplement and IDA funds pay for TA experts to give shor course training in various farming system components to BARI and BRRI FSR researchers and to supervise some of the research; or the projects pay for the BARI and BRRI researchers to receive training concerning on-farm trial from BAU scientists and BFRI scientists who have expertise in particular component areas.

Some examples of the types of research that have been carried out a the FSR sites that go beyond cropping systems research are listed below:

1. - Homestead Garden Surveys. Women Block Supervisors have been assigned to five FSR sites to conduct in-depth homestead surveys. They were carrying these out when we were making our RRA visits. There is one OFR woman sociologist who is helping to supervise these surveys.

2. - Homestead Garden Trials. This was a project initiated this last year by the OFRD and the APA at Kalikapur. The project has provided fences and a few water pumps and seedlings for about 40 cooperator farmers to try 5 year-round vegetable cropping patterns. There was a training class at the RARS at the beginning. The cooperator families are collecting yield data a they harvest garden plots. We talked with several cooperator farmers and found quite a bit of interest in this project. One problem is that the project should have been geared to women, who seem to frequently be the ones responsible for homestead production. However, there was no special effort made to organize the training and the trials for women in the households. Only two of the 40 trainees were women. The APA noted that h had tried to start this homestead gardening research for two years but had problems getting official approval from the BARI Horticulture Division because of bureaucratic conflicts beteween OFRD and Horticulture.

3. - Homestead Garden Case Studies. All of the BARI women officers participated in collecting homestead garden case studies at various FSR sites.

4. - Survey on Compatibility of Homestead Crops and Trees and Livestock. Jamalpur OFRD conducted this study under the supervision of the APA

Vignarajah. This survey determined that aroids (e.g., ginger, tumeric, an taro) would be a compatible homestead crop because cattle would not eat them or damage them.

5. - Homestead CAttle Feeding Trials. The APA , Vignarajah, after waitin for two years for the promised livestock officers from BLRI contacted livestock expert at BAU. With his help, he designed homestead trials t test the nutritional benefits of urea treated straw on cattle weight an milk production. We saw these in progress when we visited the site.

6. - Bamboo Pumps for Irrigation of Vegetables. At Jessore there were som trials at the FSR site on usefulness of bamboo pumps for vegetabl production.

7. - BAU Case Studies to determine local farmer types of productio systems. BAU has made the greatest effort in defining local types o production systems and attempting to create a conceptual framework fo designing FSR research. They have taken one year to do this in two new FS sites and to organize an inter-disciplinary FSR Task Force to advise an participate in new research. Consequently, at the time of our visit the had few trials started outside of some pond fisheries projects.

It is important to note that the Forestry Research Institute has no yet started their FSR work because of delayed hiring of researchers. However, they had just hired some new people when we visited them. Thi idea of on-farm trials is so new to this institute that they probably nee some support from BAU or BARI researchers who have more experience.

SECTION 8 ANALYSIS OF FARMER INTERVIEW DATA

8.1 INTERPRETATION OF DATA TABLES

This limited RRA survey of 120 farmers does not purport to be a sufficiently large and representative sample of Bangladeshi farmers to provide generalizations with a high level of confidence. Because of this, there are limited conclusions that can be drawn from it about the impact of agricultural research programmes supported by ARP-II on Bangladeshi farmers as a whole. However, our team did interview small samples of farmers in the following sample categories: 1) the more developed BARI CSR/FSR sites; 2) areas within a five mile radius outside the FSR site boundaries; and 3) a few control areas where there are no agricultural research programmes. Our findings do provide some preliminary indications about the following: the effect of the longer duration CSR site programmes on the site farmers; the limited contact of the CSR/FSR programmes with farmers in adjacent areas; sources of technological information for the three farmer subsamples; and changes in agricultural production systems and productivity in the last five years in our small sample of farmers.

Beyond these limited findings the Farmer Interview Survey was a small-scale and flawed exercise that provided a number of lessons for any future preparation of a more rigorous and representative survey. Such a survey will require the planning, trained manpower, and funding equal to that of the BARC-BRRI survey on adoption of HYV rice.

The interview form and a partial definition of data codes is provided in Appendix 2. The RRA Team drew farmer subsamples from the following categories: CSR/FSR site farmers (FSR SITE); farmers within a 5-mile radius of the FSR site (OUT_FSR); Multiple Location Testing site and Pilot Production Programme site farmers (MLT/PPP); and farmers located in areas not near any agricultural research programmes (CONTROL). In each case the interviewers were carrying out opportunity sampling in that they drove and walked around sites and interviewed farmers as they encountered them. They also attempted to make sure subsamples included farmers with different size holdings (e.g., Large to Marginal in the code). Data from selected variables are presented in the cross tabulation tables below. Usually the data is organized for comparison between the subsamples described above. In several cases there is missing data on variables because not all interviewers were uniformly asking the more detailed crop variety, fertilizer input and yield questions. Below are provided summary points on each of the tables.

<u>Sample Description</u>

TABLE 1 - The samples from Ishurdi Region and Hathazari Region are the largest because 1) there were more interviewers on the team on those visits and 2) they also sampled control sites in those two regions.

TABLE 2 - Over half of the interviews were conducted with farmers inside and outside the four FSR sites near the BARI regional stations. This Table indicates 23% of the 120 interviews were conducted within the FSR sites and 32% in various directions within a 5 mile circumference around

the FSR sites. The 4 FSR sites sampled are the older CSR sites which have been in operation since 1981-82 and which have been close enough to BARI RARS that they have had many on-farm trials, field days, and surveys. The OUT_FSR interviews were conducted to detect a spread effect from the research and technology transfer program focussed on the FSR site farmers. There were 18% of the sample from MLT sites and 4 interviews from the Pilot Production Programme sites that have just started. Approximately one quarter of the sample includes farmers at Control locations where there are no agricultural research efforts.

TABLE 3 - This Table shows the breakdown of the sample by size of holdings managed (FARMTYPE). The five types have been defined by the National CSR/FSR Programme (see Appendix 2 code). The RRA team tried to draw the sample from all of these categories but was most successful in finding medium (33% of sample) and large (23%) holding farmers. There was a higher percentage of medium and large landholders (76% combined) from the FSR sites than from the OUT_FSR sites (49%) or Control sites (48%). This is possibly due to bias from the small sample size, or it could be due to the expansion of irrigati n in these long-time CSR/FSR sites and the concentration of irrigated landholdings in fewer hands.

TABLE 4- This table indicates that 58% of the sampled farmers had both irrigated and rainfed holdings with 28% having only rainfed holdings and 14% only irrigated holdings. Most farmers reported deep tubewell or shallow tubewell systems; however,the chora system was important to farmers in the Chittagong area. The team did not collect systematic data on reliability of irrigation systems, but many farmers noted major problems with reliability of water.

Changes in Agricultural Production Methods

TABLE 5- The responses summarized answer the question "Have you made technological improvements in your mode of agricultural production in the last five years?" Most farmers (91%) of the 111 farmers who responded answered "Yes". All of the farmers in the FSR sites and a high percentage of those in the OUT_FSR and MLT sites responded "Yes". Only 81% of the Control farmers responded "Yes". This suggests that some Control farmers are in the least accessible areas and have less contact with technology transfer programs or have less resources to make such improvements.

TABLE 6 -One thrust of the agricultural research programs at the CSR/FSR and MLT/PPP sites is the intensification of productivity by cultivating at least two and often three crops a year. Although many farmers listed more than one cropping pattern for various holdings, this table summarizes the primary cropping pattern types (single, double, or triple) for irrigated land. The MLT/PPP site farmers and FSR site farmers had the highest percentage (37% and 29%) of triple cropping patterns compared to 17% of the OUT_FSR subsample and 7% of the Control subsample. This suggests that agricultural research outreach programs such as FSR and MLT are having some impact on target farmers. However, there seems to be a limited spread effect on farmers in adjacent areas. However, a more accurate analysis would require consideration of other critical factors such as reliability of irrigation, flooding constraints, and availability of credit and markets. It also would be

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useful to interview some farmers about when and why they began double cropping or triple cropping.

TABLE 7 - This table summerizes data on primary croppping patterns on rainfed land. Overall, compared to irrigated land, the percentage of triple cropping is reduced by half and the percentage of single cropping is increased by 15%. The OUT_FSR and MLT/PPP site farmers had about 20% triple cropping patterns on rainfed l nd with FSR farmers half that and no Control farmers with triple cropping patterns. In the FSR sites the emphasis may be on increasing the productivity of the irrigated fields with less attention to rainfed holdings. About one-third of the farmers with rainfed holdings in the Control and MLT/PPP sites had a single cropping pattern as the primary pattern.

TABLES 8a - 8b - 8c - These tables summarize data on the use of HYV rice varieties. There is widespread use of HYV types in the Boro and Aman seasons. Most (98%) of the 61 farmers who responded about Boro rice varieties used HYV. This is a new rice cropping season for many farmers which depends on reliable irrigation. Pajam or BR 3 were the most frequently planted varieties in the Boro season.

Of the 116 farmers who responded about Aman rice varieties, 52% used only HYV and 44% used both HYV and Local varieties. This is a total of 96% using some HYV types (often BR-11 and Pajam). This interview did not collect data on acreage and amount of production as the BRRI survey did. The Control and OUT_FSR samples had higher percentages of HYV only use (61% and 50% respectively) compared to 40% of the FSR site farmers. This result may be due to non-uniform interviewing techniques. However, 10% of the Control site farmers used only Local varieties for Aman compared to 4% and 3% of the FSR and OUT_FSR farmers sampled.

Only 71 farmers responded about type of varieties used in AUS production. Overall 53% used only Local varieties with the Control group having 63% Local variety use. The FSR sites had the highest percentage of farmers (50%) using only HYV during the Aus season. This small interview sample suggests that the FSR program has had a positive impact in introducing HYV for the Aus season. However, for the Boro and Aman seasons, there is widespread use of HYV by all farmers.

TABLE 8d - This table shows very few farmer responses (15) for mustard. This small response suggests that for the sampled areas HYV mustard (SS-75) has mainly been introduced through FSR sites. The planting of mustard and potatoes was not very widespread in the sampled areas but the team did not draw samples from locations where these are specialized crops.

Farmer Sources of Information for Fertilizer and Pesticides

TABLE 9 - This table gives responses to the question "What is your primary source of fertilizer information?" Of the total sample, 113 farmers responded. Overall the DAE (Agricultural Extension) (28%) and neighbors (27%) accounted for half of the responses. The FSR program represented the primary source of information for 80% of farmers at the FSR sites and 5% of the farmers in the OUT_FSR areas. For the OUT_FSR

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areas, neighbors (36%), DAE (29%), and BADC (16%) were primary sources of information. In the Control areas, neighbors (38%), DAE (35%), and fertilizer shop dealers were main sources of information.

TABLE 10 - Pesticide use is widespread with 87% of the 106 farmers responding stating they did use pesticides in agricultural production. However, the RRA team felt that most farmers do not have the knowledge for proper and effective use of pesticides.

TABLE 11 - Of the 79 farmers who responded about source of information on pesticides, 56% listed neighbors as a source of information, 15% dealers and 14% the FSR program. As with fertilizer information, the FSR program was the dominant source of pesticide information for FSR site farmers (55%). However, there was no direct contact of the FSR program with OUT_FSR farmers unless it was indirectly through neighbor information networks. Data on these networks could usefully be traced out in future surveys. The DAE was the source of pesticide information for 24% of OUT_FSR farmers with dealers being 14%. For the Control category, dealers and neighbors were the most important source of pesticide information. This suggests the Control areas had few links to either agricultural research or DAE outreach programs.

Farmer Contacts With Agricultural Research Programs

TABLES 12a & 12b - These tables measure degree of farmer contact with the FSR program and whether farmers find the program beneficial or not (i.e., Attitude variable). This is relevant for farmers in the FSR sites and those in the OUT_FSR areas adjacent to the FSR sites (5 mile radius). Of the FSR site sample 56% had been "cooperator farmers" with on-farm trials on their land and 33% had attended more than one FSR fieldday. All farmers had had some contact with the program and thought it was beneficial to farmers. In contrast, in the areas adjacent to the FSR sites, 56% of the farmers did not know about the FSR program and 31% had only heard about it but had not attended fielddays or talked in more detail with a "contact farmer". The RRA Team was surprised to find the limited knowledge about the FSR program outside the FSR site. This seems to be due to the insularity of adjacent villages (e.g., the inappropriateness of attending a fieldday if not invited or speaking with farmers one doesn't know well) and the limited OFRD time and budget for making direct contact with farmers in a larger area than the FSR site. This wider contact is also assumed to be the responsibility of DAE Block Supervisors who are not always making these contacts nor passing on useful technological information.

TABLE 13 - This data measures the degree of farmer contacts with the BARI RARS or substations. The Control areas were distant from the RARS and only one farmer had attended fielddays. Many FSR site farmers had invitations to these events and knowledge of the work at the RARS (usually located within 15 miles of the FSR site). Of these farmers, 67% had attended multiple field days and 22% had heard about the RARS work. In contrast, in the adjacent villages in the OUT_FSR sample only 23% of the farmers had attended one or more fielddays and 33% had heard about the RARS. The table indicates that RARS fieldday invitations mainly are provided to the FSR site, MLT site, and some of the PPP site farmers. The agricultural research system has a limited network of

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client farmers who are directly benefitting from the agricultural research system outreach programs.

TABLE 14 - This table indicates that of the 21 farmers interviewed in areas where there were MLT programs, 71% had been cooperator farmers and 24% had heard about the program or had talked about it with a cooperator farmer. However in this case, interviewers were searching for cooperator farmers to interview about the program. The tiny sample of four farmers from the PPP areas is not sufficient to provide any indication of program impact.

Farmer Contacts With Extension and Other Agricultural Agencies

TABLES 15a & 15b - These data measure the degree of contact between this sample farmers and the DAE Block Supervisors or the DAE Upazila officers. Of the 118 farmers who responded about Block Supervisors, 42% had no contact; 38% had little contact; and only 20% had regular assistance. However, the Control areas, which represent more inaccessible areas not near district or regional towns, had by far the least contact with the DAE. In contrast, 56% of the FSR site farmers and 58% OUT_FSR farmers reported limited contact with the Block Supervisors. There is also little contact (14%) with DAE Upazila officers in the Control group, and only 30% contact in the FSR site sample. Overall, 60% of the farmers in the sample have no contact with DAE Upazila officers.

TABLE 15c - This table provides a similar picture of contact with BADC with very little contact with Control site farmers and little contact at FSR and OUT-FSR sites. Often when the farmers were discussing BADC assistance, it was related to installation and maintenance of water pumps.

TABLE 15d - This table indicates that of our sample, 94% of the 118 farmers responding had no contact with BRDB farmer cooperatives. The efforts of BRDB are apparently focussed in selected locations, and the team did not interview farmers in locations where these programs were important.

Farmer Fertilizer Use With HYV and Irrigation

TABLES 16a - 16b - 16c - The recommended amounts of urea for high yields of Boro rice in moderately fertile soils is in the range of 95 seers per acre. In the sample of 50 farmers who cultivate Boro rice and responded to this question, it was found that over half of the farmers are not applying this high amount. Only 40% applied 80 seers/acre or above. The FSR and OUT_FSR farmers have 46% and 45% of the farmers applying 80 seers per acre or above while only 22% of the Control farmers apply this amount. For TSP input for Boro rice, the recommended amount for high yields is 75-80 seers/acre. Overall about 40% of the 49 farmers who responded used 60-80 seers per acre. However, 50% of the Control site farmers used 20-40 seers/acre compared to about 35% of the FSR and OUT_FSR site farmers. Recommended MP applications are 40-45 seers/acre but few farmers of the sample of 45 responding used this much. Most of the Control site farmers (83%) and half of the FSR site farmers (47%) were using less than 20 seers/acre with OUT_FSR farmers using more.

Generally the FSR and OUT_FSR farmers are using more fertilizer for Boro rice, but more data is required to determine what role the FSR program and other factors (e.g.,more reliable irrigation, better fertilizer access or prices, better credit) play in farmer decision-making about fertilizer use.

TABLES 17a-17b-17c - There were 71 farmers with irrigated land who responded to questions on detailed fertilizer inputs for HYV Aman rice. The recommended amount of urea for high yields from moderately fertile land is 75-80 seers/acre. Of the 71 farmers in the sample, 45% applied 60-80 seers/acre with 33% stating they applied higher amounts (up to the 100-120 seers/acre range). At least one-third of the reporting farmers stated they were applying more than the recommended amount. About 50% of the FSR site farmers are applying more than the recommended amounts of urea but about 3/4 of the farmers in the Control sites, FSR sites, and OUT_FSR sites reported they were applying recommended urea doses or above. The excessive amounts suggest either very depleted soils to begin with and/or inefficient application methods under irrigation and therefore high N losses from the system.

The recommended Aman TSP inputs for high yields are 55-60 seers/acre. In the sample of 67 farmers responding to this question, 53% were using recommended or higher dosages and 47% using less than recommended amounts. The FSR site farmers are using more TSP than the OUT_FSR or Control site farmers. Overall 70% of the 56 farmers in the subsample are using sufficient or excessive amounts of MP for the Aman rice crop. The OUT_FSR farmers generally are using higher amounts and the Control site farmers using much less.

TABLE 18 -Recommended urea inputs for HYV wheat for high yields are 110-115 seers/acre. This table indicates that urea inputs are much lower than these recommended rates with 95% of the small subsample (20) of responding farmers indicating that they put on 60-80 seers/acre or less.

TABLE 19 - The very small subsample of 9 farmers who reported fertilizer inputs on mustard (only from the FSR and OUT_FSR sites) reported urea inputs much lower than the recommended amounts for Tori-7 (at 90-100 seers/acre) and SS-75 (140-145 seers/acre). Most inputs were in the 40-80 seers/acre range. In contrast to the rice crops, farmers in this sample do not appear to choose to use extra inputs for this crop.

Farmer Yields

TABLES 20a-20b-20c-20d - One assumption in the interpretation of this yield data is that if HYV rice and wheat are planted, the farmer was cultivating them on irrigated land. High yield targets for Boro rice are in the 60-80 maunds/acre range. Only 29% of the farmers overall (a total of 48 farmers responding) were achieving this high yield range or above. The FSR subsample had a higher percentage of farmers (35%) in this high yield range than the Control (20%) and the OUT_FSR (24%) subsamples. Over half of the farmers overall had yields in the 40-60 mds/acre range. With the limited data collected it is not possible to determine why more FSR farmers are reporting higher Boro yields. It may be related to higher fertilizer inputs, other FSR improved technologies, or more reliable irrigation.

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High yield goals for Aman rice are 40-60 mds/acre. Of the 87 farmers reporting yields for Aman rice, 61% reported yields in this range with 25% reporting even higher yields. However, more FSR farmers were achieving these higher yields (35% in the 60-80 mds/acre range) compared to about 20% for Control, OUT_FSR, and MLT site farmers. The slightly higher FSR Aman yields may reflect the higher fertilizer input of the FSR farmers on Aman rice.

None of the 26 farmers in the subsample who reported wheat yields reached the high yield goal range of 55-75 mds/acre. Fifty percent of this sample had yields in the 30-50 mds/acre range with more FSR and OUT_FSR farmers reporting these yields. About 50% of the reporting farmers had yields in the 10-30 mds/acre range. Two possible explanations for less than optimal yields are: 1) the less than optimal use of fertilizer on wheat reported in TABLE 8 and 2) team findings that farmers are often planting wheat on land that does not have reliable irrigation. If well-irrigated land is available, they will choose to plant Boro rice.

Farmer Estimates of Increased Yields from Technological Improvements

TABLES 21a-21b-21c - The 39 farmers who reported on increased Boro yields were comparing HYV Boro production with previous Aus production which was often broadcast and dependent on rainfall. Of the sample 10% reported increased yields in the 40-60 mds/acre range and 69% reported increases of 20-40 mds/acre. The FSR site farmers reported the highest yield increases (92%) in the 20-60 mds/acre range, and the Control site farmers reported the lowest increases (56%) in this range. However, it is obvious that the change from broadcast Aus to irrigated and transplanted Boro has significantly increased production for these 39 reporting farmers.

Because interviewers did not uniformly ask about increased yields in Aus production, the subsample of 19 farmers is too small to give much indication about what is happening in this season.

Of the 68 farmers who responded to the question of increased yields in Aman rice, 14% reported increased yields of 40-60 mds/acre or more and 57% reported increases in the 20-40 mds/acre range. In the FSR sites, 86% of the farmers had 20-60 mds/acre increase and the OUT_FSR farmers had 70% reporting similar increases. In contrast, only 50% of the reporting Control site farmers had increased yields of this magnitude. Without additional interview data it is not possible to determine what factors are responsible for the better FSR and moderately better OUT_FSR Aman yield increases. However, during interviews the FSR farmers generally attributed much of this increase to knowledge they had gotten through their contacts with the FSR program.

8.2 FARMER INTERVIEW DATA TABLES

1987 ARP - II RAPID RURAL APPRAISAL: FARMER INTERVIEW DATA

(% IN PARENTHESES)

Table 1 Region vs. Site

SITE	HATHAZ	ISHURDI	JAMALPUR	JESSORE	ALL
BAGHERPARA	-	-	-	19	19
BARURA	4	-	-	-	4
BODA	-	2	-	-	2
CHATMOHAR	-	4	-	-	4
COMILLA	1	-	-	-	1
COX-BAZAR	7	-	-	-	7
DORBUST	2	-	-	-	2
GODAGARI	-	3	-	-	3
HATHAZARI	17	-	-	-	17
JANOKINATHPUR	-	3	-	-	3
JOYNTHAPUR	2	-	-	-	2
KALIKAPUR	-	16	-	-	16
LAHERIKANDA	-	-	15	-	15
MELANDHA	-	-	2	-	2
NAWABGANJ	-	4	-	-	4
PANCHAGARH	-	5	-	-	5
PATIYA	1	-	-	-	1
PUTIA	-	5	-	-	5
RAJSHAHI	-	2	-	-	2
SAROIL	-	1	-	-	1
UTTAR-DABIPUR	-	5	-	-	5
ALL	34 (28)	50 (42)	17 (14)	19 (16)	120

Table 2 Region Vs. Category

CATEGORY	HATHAZ	ISHURDI	JAMALPUR	JESSORE	ALL
CONTROL	10	19	-	-	29 (24)
FSRSITE	6	10	8	3	27 (23)
OUT-FSR	7	9	7	16	39 (32)
MLTSITE	7	12	2	-	21 (18)
PP-PROG	4	-	-	-	4 (3)
ALL	34	50	17	19	120

Table 3 Category vs. Farmtype

FARMTYPE	CONTROL	FSRSITE	OUT-FSR	MLT & PPP	ALL
LARGE	4 (14)	9 (23)	9 (23)	7 (28)	27 (23)
MEDIUM	10 (34)	10 (26)	10 (26)	8 (32)	39 (33)
SMALL	5 (17)	9 (23)	9 (23)	4 (16)	21 (16)
MARGINAL	2 (7)	6 (15)	6 (15)	3 (12)	15 (13)
LANDLESS	8 (28)	5 (13)	5 (13)	3 (12)	18 (15)
ALL	29	27	39	25	120

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(% IN PARENTHESES)

Table 4 - Number of Farmers With Irrigated and Rainfed Land

(% of Total Sample)

(Irrigated Holdings)

		NO	YES	ALL
RAINFED	NO	-	17 (14)	17 (14)
HOLDINGS	YES	34 (28)	69 (58)	103 (86)
	ALL	34	86 (72)	120

Table 5 Category vs. Change in Production Methods In Last 5 Years

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
YES	22 (81)	25	33 (92)	20 (87)	100 (91)
NO	5 (19)	-	3 (8)	2 (13)	11 (9)
ALL	27	25	36	23	111

Table 6 - Primary Cropping Pattern Types on Irrigated Land

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
TRIPLE CROP	1 (7)	7 (29)	5 (17)	7 (37)	20 (23)
DOUBLE CROP	12 (80)	17 (71)	24 (80)	11 (58)	64 (73)
SINGLE CROP	2 (13)	-	1 (3)	1 (5)	4 (4)
All	15	24	30	19	88

Table 7 - Primary Cropping Pattern Types on Rainfed Land

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
TRIPLE CROP	-	2 (11)	5 (18)	3 (19)	10 (12)
DOUBLE CROP	13 (68)	14 (78)	20 (71)	8 (50)	55 (68)
SINGLE CROP	6 (32)	2 (11)	3 (11)	5 (31)	16 (20)
All	19	18	28	16	81

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(% In Parentheses)

Table 8a Category vs. Aus Type

	CONTROL	FSRSITE	MLT & PPP	OUT-FSR	ALL
LOC	10 (63)	8 (44)	5 (28)	9 (47)	38 (53)
HYV	2 (12)	9 (50)	2 (11)	4 (21)	17 (24)
BOTH	4 (25)	1 (6)	11 (61)	6 (32)	16 (23)
ALL	16	18	18	19	71

Table 8b Category vs. Aman Type

	CONTROL	FSRSITE	MLT & PPP	OUT-FSR	ALL
LOC	3 (10)	1 (4)	-	1 (3)	5 (4)
HYV	17 (61)	10 (40)	14 (56)	19 (50)	60 (52)
BOTH	8 (29)	14 (56)	11 (44)	18 (47)	51 (44)
ALL	28	25	25	38	116

Table 8c Category vs. Boro Type

	CONTROL	FSRSITE	MLT & PPP	OUT-FSR	ALL
LOC	-	-	1 (9)	-	1 (2)
HYV	13	14 (93)	10 (91)	22	59 (96)
BOTH	-	1 (7)	-	-	1 (2)
ALL	13	15	11	22	61

Table 8d Category vs. Mustard Variety

	CONTROL	FSRSITE	MLT & PPP	OUT-FSR	ALL
LOC	-	2 (29)	-	2 (29)	4 (27)
HYV	-	5 (71)	1	3 (42)	9 (60)
BOTH	-	-	-	2 (29)	2 (13)
ALL	0	7	1	7	15

(% IN PARENTHESES)

Table 9 Category vs. Primary Info-Source for Fertilizer Use

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
FERTINFO BADC	1 (4)	1 (4)	6 (16)	3 (13)	11 (10)
BARD	-	-	1 (3)	-	1 (1)
BRDB	-	-	1 (3)	-	1 (1)
DAE	9 (35)	-	11 (29)	12 (50)	32 (28)
DEALER	6 (23)	1 (4)	2 (5)	2 (8)	11 (10)
FSR	-	20 (80)	2 (5)	-	22 (19)
MLT	-	-	-	1 (4)	1 (1)
NEIGHBOR	10 (38)	2 (8)	14 (36)	4 (17)	30 (27)
PPP	-	-	1 (3)	-	1 (1)
RARS	-	1 (4)	-	2 (8)	3 (2)
ALL	26	25	38	24	113

Table 10 Category vs. Pesticide Use

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
YES	23 (88)	21 (88)	27 (82)	21 (91)	92 (87)
NO	3 (12)	3 (12)	6 (18	2 (9)	14 (13)
ALL	26	24	33	23	106

Table 11 Category vs. Pesticide Info-Source

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
PESTINFO BADC	-	-	1 (5)	-	1 (1)
DAE	1 (5)	-	5 (24)	12 (12)	8 (10)
DEALER	6 (29)	1 (5)	3 (14)	2 (12)	12 (15)
FSR	-	11 (55)	-	-	11 (14)
MLT	-	-	-	1 (5)	1 (1)
NEIGHBOR	14 (64)	6 (3)	12 (57)	12 (71)	44 (56)
RARS	-	2 (10)	-	-	2 (3)
ALL	21	20	21	17	79

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(% In Parentheses) (NA = Not Applicable)

Table 12a Category vs. Contact with FSR Program

		CONTROL	FSRSITE	OUT - FSR	MLT & PP	ALL
F	COOP-FARMER	-	15 (56)	-	-	15 (13)
S	CONTACT-COOP	-	2 (7)	1 (3)	1 (4)	4 (3)
R	FIELD DAYS	-	9 (33)	5 (2)	1 (4)	12 (10)
	FIELD DAY 1	-	1 (4)	2 (5)	2 (8)	5 (4)
	HEARD	-	-	12 (31)	8 (32)	20 (17)
	NOT KNOWN	-	-	22 (56)	11 (44)	33 (27)
	NA	29	-	-	2 (8)	26 (31)
ALL		29	27	39	25	120

Table 12b Category vs. Attitude About FSR

(Is FSR Useful to Farmers?)

		CONTROL	FSRSITE	OUT - FSR	MLT & PPP	ALL
A	YES	-	27	11 (32)	8 (38)	46 (56)
T	NO	-	-	-	1 (5)	1 (1)
T	NA	-	-	23 (68)	12 (57)	35 (43)
I						
T	ALL		27	34	21	82

Table 13 Category vs. Contact with RARS or Substations

		CONTROL	FSRSITE	OUT - FSR	MLT &PPP	ALL
R	FIELDDAYS	1 (3)	18 (67)	6 (15)	6 (12)	31 (26)
A	FIELD DAY 1	-	-	3 (8)	2 (8)	5 (4)
R	HEARD	-	6 (22)	13 (33)	6 (24)	25 (21)
S	NOT-KNOWN	6 (21)	3 (11)	17 (44)	7 (27)	33 (27)
	NA	22 (76)	-	-	4 (15)	26 (21)
ALL		29	27	39	25	120

Table 14 Category vs. Contact with MLT Program & PP Program

	MLTSITES	PPP - SITES
COOP-FARMER	15 (71)	-
CONTACT COOP	1 (5)	-
HEARD	4 (19)	2 (50)
NOT-KNOWN	1 (5)	2 (50)
NA	-	
ALL	21	4

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(% IN PARENTHESES)

TABLE 15A - CATEGORY VS. CONTACT WITH DAE BLOCK SUPERVISOR

(% OF TOTAL SAMPLE)

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
REG-ASSISTANCE	3 (10)	6 (23)	7 (19)	8 (32)	24 (20)
LITTLE-CONTACT	8 (29)	9 (33)	15 (39)	13 (52)	45 (38)
NO-CONTACT	17 (61)	12 (44)	16 (42)	4 (16)	49 (42)
ALL	28	27	38	25	118

TABLE 15B - CATEGORY VS. CONTACT WITH DAE UPAZILA OFFICE

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
REG-ASSISTANCE	1 (4)	1 (4)	4 (11)	4 (16)	10 (9)
LITTLE-CONTACT	3 (10)	7 (26)	13 (34)	14 (56)	37 (31)
NO-CONTACT	24 (86)	19 (70)	21 (55)	7 (28)	71 (60)
ALL	28	27	38	25	118

TABLE 15C - CATEGORY VS. CONTACT WITH BADC

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
REG-ASSISTANCE	0	1 (3)	2 (5)	0	3 (3)
LITTLE-CONTACT	6 (21)	8 (30)	13 (34)	5 (20)	32 (27)
NO-CONTACT	22 (79)	18 (67)	23 (61)	20 (80)	83 (70)
ALL	28	27	38	25	118

TABLE 15D - CATEGORY VS. CONTACT WITH BRDB

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
REG-ASSISTANCE	0	0	2 (5)	0	2 (2)
LITTLE-CONTACT	0	1 (4)	3 (8)	1 (4)	5 (4)
NO-CONTACT	28	26	33 (87)	24 (96)	111 (94)
ALL	28	27	38	25	118

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(% IN PARENTHESES)

Table 16a - Category vs. Use of MP on Irrigated Boro Rice (Seers/Acre)

(% of Total Sample)

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
BORO MP Less Than 20	5 (83)	7 (47)	5 (26)	1 (20)	18 (40)
20 TO 40	0	8 (53)	11 (58)	4 (80)	23 (51)
More Than 40	1 (17)	0	3 (16)	0	4 (9)
ALL	6	15	19	5	45

Table 16b - Category vs. Use of TSP on Irrigated Boro Rice (Seers/Acre)

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
BORO TSP Less Than 60	5 (63)	9 (60)	11 (55)	6 (100)	31 (63)
60 TO 80	3 (37)	6 (40)	6 (30)	0	15 (31)
More Than 80	0	0	3 (15)	0	3 (6)
ALL	8	15	20	6	49

Table 16c - Category vs. Use of Urea on Irrigated Boro Rice (Seers/Acre)

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
BORO UREA Less Than 60	1 (11)	2 (14)	3 (33)	2 (34)	8 (16)
60 TO 80	6 (67)	6 (40)	8 (40)	2 (33)	22 (44)
More Than 80	2 (22)	7 (46)	9 (45)	2 (33)	20 (40)
ALL	9	15	20	6	50

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(% IN PARENTHESES)

Table 17a - Category vs. Use of MP on Aman Rice (Seers/Acre)

(% of Total Sample)

AMANMP	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
Less Than 20	4 (57)	7 (37)	3 (17)	3 (25)	17 (30)
20 TO 40	2 (29)	10 (53)	12 (67)	8 (67)	32 (57)
More Than 40	1 (14)	2 (10)	3 (16)	1 (8)	7 (13)
ALL	7	19	18	12	56

Table 17b - Category vs. Use of TSP on Amon Rice (Seers/Acre)

AMANTSP	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
Less Than 60	7 (70)	14 (70)	15 (68)	14 (93)	50 (75)
60 TO 80	3 (30)	6 (30)	4 (18)	0	13 (19)
More Than 80	0	0	3 (14)	1 (7)	4 (6)
ALL	10	20	22	15	67

Table 17c - Category vs. Use of Urea on Aman Rice (Seers/Acre

AMANUREA	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
Less Than 60	3 (27)	4 (20)	5 (21)	4 (25)	16 (23)
60 TO 80	7 (64)	6 (30)	11 (46)	8 (50)	32 (45)
More Than 80	1 (9)	10 (50)	8 (33)	4 (25)	23 (32)
ALL	11	20	24	16	71

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Table 18 - Category vs. Use of Urea on Wheat (Seers/Acre)

(% of Total Sample)

WHEAT UREA	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
Less Than 40	0	1 (20)	2 (34)	0	3 (15)
40 TO 60	1 (25)	1 (20)	0	2 (40)	4 (20)
More Than 60	3 (75)	3 (60)	4 (66)	3 (60)	13 (65)
ALL	4	5	6	5	20

Table 19 - Category vs. Use of Urea on Mustard (Seers/Acre)

MUSTUREA	CONTROL	FSRSITE	OUT-FSR	ALL
Less Than 40		0	2 (40)	0
40 TO 60	0	2 (40)	1 (25)	3 (33)
More Than 60	0	1 (20)	3 (75)	4 (45)
ALL	0	5	4	9

2 (22)

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(% In Parentheses)

Table 20a Category Vs Aus HYV Yields (Maunds/Acre)

	CONTROL	FSRSITE	OUT-FSR	MLTSITE	ALL
1 TO 20	-	2 (22)	-	-	2 (9)
21 TO 40	2 (67)	3 (33)	2 (33)	4 (80)	11 (48)
41 TO 60	-	4 (45)	1 (17)	1 (20)	6 (26)
61 TO 80	1 (33)	-	3 (50)	-	4 (17)
ALL	3	9	6	5	23

Table 20b Category vs. Aman HYV Yields (Maunds/Acre)

	CONTROL	FSRSITE	OUT-FSR	MLTSITE	ALL
21 TO 40	3 (15)	3 (11)	4 (17)	-	12 (14)
41 TO 60	13 (65)	14 (54)	14 (58)	12 (80)	53 (61)
61 TO 80	4 (20)	9 (35)	5 (21)	3 (20)	21 (24)
81 TO 100	-	-	1 (4)	-	1 (1)
ALL	20	26	24	15	87

Table 20c Category vs. Boro HYV Yields (Maunds/Acre)

	CONTROL	FSRSITE	OUT-FSR	MLTSITE	ALL
21 TO 40	2 (20)	2 (14)	2 (13)	-	7 (15)
41 TO 60	6 (50)	7 (50)	10 (63)	3 (50)	27 (56)
61 TO 80	2 (20)	4 (29)	3 (18)	3 (50)	12 (25)
81 TO 100	-	1 (7)	1 (6)	-	2 (4)
ALL	10	14	16	6	48

Table 20d Category vs.Wheat Yields (Maunds/Acre)

	CONTROL	FSRSITE	OUT-FSR	MLTSITE	ALL
10 TO 20	1 (12)	1 (17)	-	-	2 (8)
20 TO 30	4 (44)	1 (17)	3 (50)	3 (66)	11 (42)
30 TO 40	4 (44)	3 (50)	3 (50)	2 (40)	12 (46)
40 TO 50	-	1 (16)	-	-	1 (4)
ALL	9	6	6	5	26

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Table 21a Category vs. Aman Yield Increases (Maunds/Acre)

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
1 TO 20	6 (50)	3 (14)	6 (30)	5 (36)	20 (29)
21 TO 40	4 (53)	16 (72)	11 (55)	8 (57)	39 (57)
41 TO 60	2 (17)	3 (14)	3 (15)	-	8 (12)
61 To 80	-	-	-	1 (7)	1 (2)
All	12	22	20	14	68

Table 21b Category vs. Boro Yield Increases (Maunds/Acre)

	CONTROL	FSRSITE	OUT-FSR	MLT/PPP	ALL
1 TO 20	4 (44)	1 (8)	3 (27)	-	8 (21)
21 TO 40	4 (44)	11 (85)	6 (55)	6	27 (69)
41 TO 60	1 (12)	1 (7)	2 (18)	-	4 (10)
All	9	13	11	6	39

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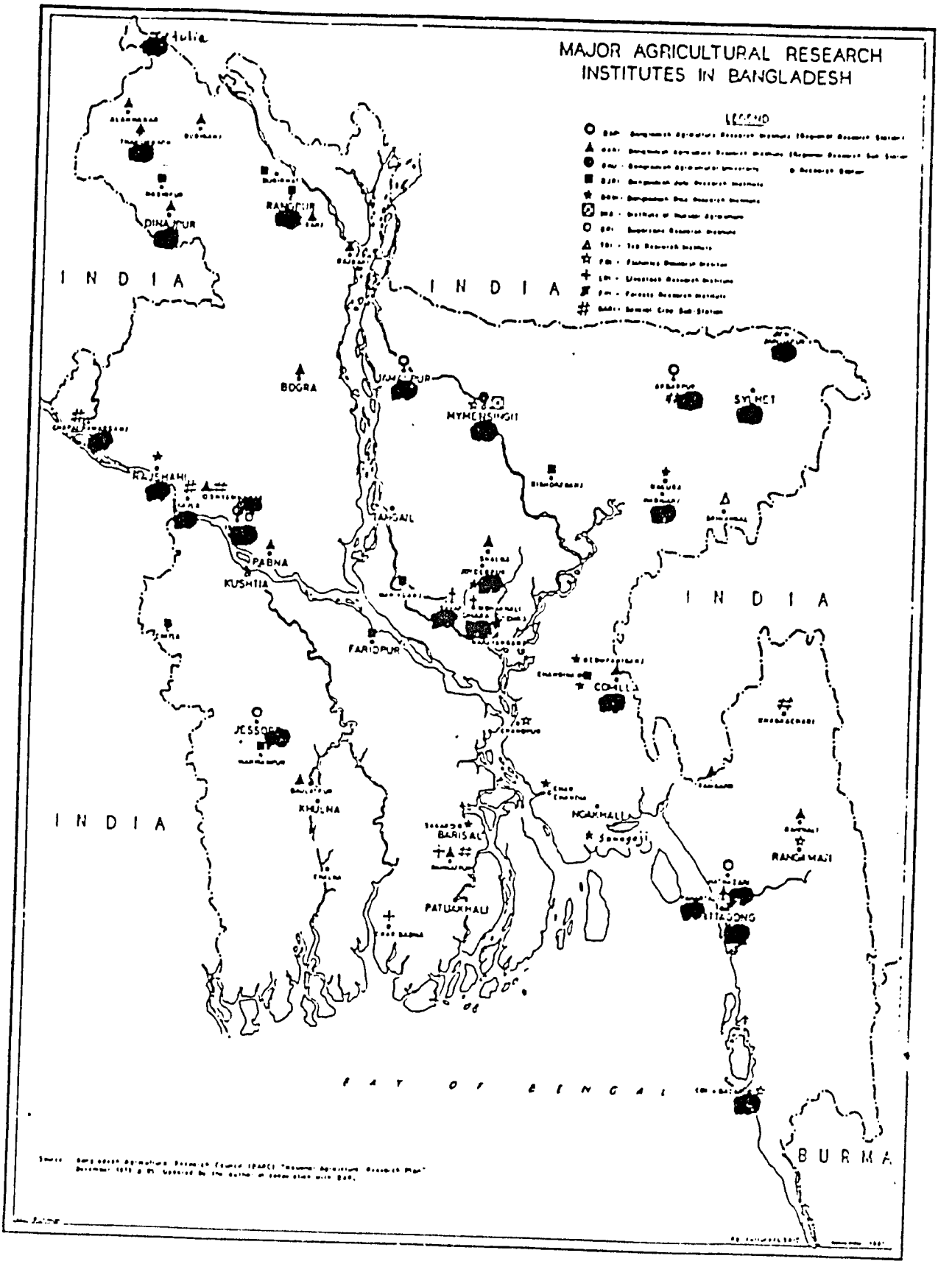
SELECTED TABLES AND MAP ACCOMPANYING REPORT TEXT

MAP 1:- SITES VISITED BY RRA TEAM



ITINERARY: Activities of the ARA-II Rapid Appraisal Team

Date	Location	Activities	Members Involved
March 16-18, 1987	BARI, RARS Jessore	- Interview farmers, Scientists and extension officials - Discussion with In-Charge, RARS, T.A Specialist and researchers - Attended Field day - Visit RARS field trials and facilities - Visit FSR & MLT sites	4 - KC, MZ, MHR, MA
March 21-28, 1987	a) BARI, RARS Ishurdi b) SRTI, Ishurdi c) BFRI, Regional Station, Ishurdi d) BARI, Station Shyampur, Rajshahi e) Control Area - Nawabgonj	- Interview farmers, Scientists and extension officials - Discussion with In-Charge, SRTI, BFRI & BARI Regional Stations, RARS, T.A. Specialist and researchers. - Attended DTC and RTC Meeting - Visit FSR & MLT sites - Visit RARS field trials and facilities. - Interview farmers in Control Area	5-KC, MZ, MHR, MLR, MA
March 29-April 2, 1987	a) BARC, DLS BJRI, Dhaka b) BFRI & BARI HQ, Joydebpur c) BLRI, Savar	- Collection of documents - Discussion with Director General of BJRI & BFRI and Director of BARI, BLRI and DLS.	3 - MHR, MA, MSA
April 5-9, 1987	a) BARI, RARS Jamalpur b) BAU, Mymensingh c) FRI, Mymensingh d) BINA, Mymensingh	- Interview farmers, Scientists & extension officials - Discussion with In-Charge, RARS, T.A. Specialist, researchers, Director of BINA, FRI, BAU RES & Prof. of Irrigation Dept., BAU.	5 - KC, MZ, MHR, MA, MSA
April 12-18, 1987	a) Chittagong b) BARI, RARS Hathazari c) BFRI d) Control Area Cox's Bazar	- Interview farmers, Scientists and Extension Officials - Discussion with In-Charge, RARS researchers & Director of BFRI - Visit FSR & MLT sites - Visit RARS field trials and facility - Interview farmers in Control Area.	6 - KC, MZ, MHR MLR, MSA, MA

Date	Location	Activities	Members Involved
April 20-24, 1987	a) BARI, Stations Rangpur, Dinajpur Thakurgaon b) Control Area Tetulia	- Interview farmers, Scientists and extension officials - Visit FSR & MLT sites - Visit field trials of the Stations - Interview farmers in Control Area.	2 - MIR, MA
April 26-30, 1987	a) BRRI, Regional Station, Comilla b) Soil Analytical Lab., Comilla c) Habiganj & Moulvi Bazar d) BARI, Jointapur e) Control Area, Sylhet	- Interview farmers, scientists and extension officials - Discussion with In-Charge, BRRI Regional Station - Visit MLT sites & field trials - Interview farmers in Control Area.	

CHRONOLOGY OF BANGLADESH AGRICULTURAL RESEARCH SYSTEM

Year	
1906	Bengal Department of Agriculture (BDA) was established.
1908	Rice Research was started in the BDA.
1908	A nucleus agril. res. lab. was established at Tejgaon, Dhaka to serve the provinces of Bengal and Assam.
1908	403 acres experimental station was set up and became known as the Dhaka Farms.
1925	Seventeen scientists were conducting research on rice, jute, cotton, oilseeds, pulses, and sugarcane.
1929	Formation of the Imperial Council of Agricultural Research while agriculture was a provincial responsibilities, the new council gave nationwide coordination to the work at the central research institutes and the state research centres.
1938	Establishment of the Bengal Agricultural Institute for higher education in agricultural sciences. This is now BAI, affiliated with the BAU and administered by BARI.
1946	National Farms were seed multiplication farms.
1947	Food and Agril. Council established in Pakistan.
1951	Establishment of the Jute Research Institute at Dhaka and Sugar Research Institute at Ishurdi.
1955	Establishment of Forests Research Institute at Chittagong.
1958	Tea Research Institute was established.
1960	EPADC created, it controls some of the National Farms and other controled by EPDA.
1961	The Atomic Energy Agril. Res. Centre was established.
1962	Establishment of the BAU at Mymensingh. USAID and IDA provided support for TA (texas A & M) training, equipments and constitution from 1962-70)
1962	600 acres of Dhaka Farms which was used as field lab. for agril. res. was taken over by the Government to became the site of the Second Capital, an area today called Sher-e-Bangla Nagar.
1964	The Pakistan Agril. Res. Council established at Karachi.
1965	First HYV rice was introduced in East Pakistan by IRRI (1965-70 IRRI varieties released)
1966	650 acres of land taken over by the Government at Joydebpur as a replacement of Dhaka Farms.
1969	The E.P. Agricultural Department was splited into two parts: the Directorate of Agriculture Extension and Management) and the Directorate of Agriculture (Research and Eduction). Forerunner of BARI Colled DA (R&E)
1970	Establishment of the East Pakistan Rice Research Institute with major support by IRRI, which is now BRRI, facilities completed in 1973-74.
1973	BARC was established.
1973	The first HYVs of wheat were reproduced into Bangladesh by CIMMYT.

1972	The BINA was established at Mymensingh.
1976	The BARC was given the authority to coordinate and provide leadership to the national agricultural research system.
1976	The BARI became an autonomous body following the dissolution of the Directorate of Agriculture (Research and Education) USAID ARP-I support from 1976-79.
1977	IPSA established at Salna by Japanees Grant.
1979	BRRI started cropping system research . (BARI, BJRI, BAU started CSR in 1980-82 funded by USAID Phase -II and IDA).
1979-82	IDA built 3 Regional Stations and USAID one.
1981-82	Bench Mark Studies at CSR sites
1983	On-Farm Trials started.
1983-84	ENRP started with IDA support at north-west districts..
1983	BARI, BRRI, BJRI and BINA became the constituent organizations of BARC.
1984	Agricultural College was established at Patuakhali.
1985	OFRD was established within BARI and MLT began in 1986.
1985	Transformation of CSR to FSR program started and new FSR site added.
1986	Livestock Research Institute was established at Savar.
1986	PPP started in some places.

Table 4: Farmers Interviewed at Sites

FSR Sites	Includes outside FSR
KALIK	Kalikapur (Ishurdi)
LAHERI	Laherikanda (Jamalpur-includes PPP)
BAGHER	Bagherpara (Jessore)
HATHAZARI	Hathazari (includes PPP)
SAROIL	Saroil (Rajshahi)
JANOKI	Janokinathpur (Rangpur)
MLT SITES	Includes mainly Coop Farmers
NARAIL	(Jessore)
PATIYA	(Chittagong)
MELANDHA	(Jamalpur)
BARUPA	(Comilla)
UTTAR DEBIPUR	Uttar Debipur (Dinajpur)
BODA	(Panchagarh NW)
DORBUST	(Sylhet)
CHATMOHAR	(Pabna - substation)
CONTROL AREAS	
PANCHA	Panchagarh (Dinajpur)
COX BAZAR	Road from Cox's Bazar to Teknaf
PUTIA	(Rajshahi)
GODAGARI	(15 miles from Saroil FSR, Rajshahi)
NAWABGANJ	(Rajshahi)
JOYNTHA	Joyntha

Tables 1 and 2: Research Facilities Visited
And Researchers Interview

Sl.No.	Institute Visited	Researchers Interviewed (#)
1.	BARI, RARS Jessore	8
2.	BARI, RARS Ishurdi	11
3.	STRI, Ishurdi	6
4.	BRRI, Reg. Station, Shyampur	3
5.	BARI, Station, Shyampur	4
6.	BARI, Station, Kazla	1
7.	BLRI, Savar	1
8.	BARI, RARS Jamalpur	22
9.	BRRI, HQ. Joydebpur	1
10.	BARI, HQ. Joydevpur	1
11.	BJRI, HQ. Dhaka	1
12.	BAU, Mymensingh	4
13.	FRI, Mymensingh	3
14.	BINA, Mymensingh	3
15.	BARI, Station, Pahartali	2
16.	BARI, RARS Hathazari	9
17.	Forest Res., Chittagong	7
18.	BARI, Station, Rangpur	2
19.	BARI, Station, Dinajpur	1
20.	BARI, Station, Thakurgaon	-
21.	BRRI, Reg. Station, Comilla	5
22.	Soil Analytical Lab., Comilla	2
23.	BARI, Station, Akbarpur	-
24.	BARI, Station, Jointapur	1
25.	DLS, Dhaka	1
	Total	99

Table 3: DAE Offices Visited

1.	Jessore	7.	Rajshahi
2.	Jamalpur	8.	Sherpur
3.	Chittagong	9.	Thakurgaon
4.	Tetulia	10.	Boda
5.	Comilla	11.	Barura
6.	Patiya	12.	Habigong

TABLE 5: Estimated Research Program Initiation

Name of RARS	Program	Ratio-%	
		Headquarter	Station
Hathazari	Station trials	60	40
Jessore	Station trials	80 - 90	10 - 20
	FSR trials	10 - 20	80 - 90
Jamalpur	Station trials	80	20
	FSR trials	40	60
Ishurdi	Station trials	50	50
	Station trials (Pulse)	70	30

TABLE 6: STATUS OF SCIENTISTS AT RARS, BARI

	JAMALPUR		ISHURDI		JESSORE		HATHAZARI	
TOTAL	25 (V-3)		36(V-3)		23 (V-3)		28 31 (V-8)	
	Positions	Filled(F) / Vacant(V)	Positions	Filled(F) / Vacant(V)	Positions	Filled(F) / Vacant(V)	Positions	F / Va
HEAD, C.S.O	CSO-1	V	C.S.O.-1	V	C.S.O.1	V	C.S.O.-1	V-
DIVISION Agronomy	PSO-1 SSO-2 SO-1	V F F	PSO-1 SSO-2 SO-4	F F F	PSO-1 SSO-2 SSO-2	F F F	PSO-1 SO-1	V- F
Plant Breeding	PSO-1 SSO-3 SO-2	F F F	PSO-1 SSO-5 SO-5	F F F	PSO-1 SSO-3	F F	SSO-4	V-
Soil Science	SO-1	F	SSO-1	F	SO-1	F	SO-1	F
Horticulture	SO-1	F	SSO-1 SO-3	F F	—	—	PSO-1 SSO-2 SO-1	F V- V-
Ag. Econ.			SO-1	F	—	—	SSO-1	F
Plant Pathology	SSO-2 SO-1	F F	SSO-2 SO-1	F F	SSO-1 SO-1	F	SSO-1 SO-1	F F
Entomology	SSO-1	F	SSO-1 SO-1 SO-1	F F F	SSO-1	F F	SSO-2 SO-1	V- F
Training	—		—		SO-1	F	—	
Ag.Engineering	SO-1	F					SSO-1	F
Water Mgt.			SO-1	F	—		—	
Farm Mgt	SO-1	V	—		—		—	
OFRD	PSO-1 SSO-3 SO-2	F F F	PSO-1 SSO-3 SO-2	F F, V-2 F	PSO-1 SSO-3 SO-4	F F V-1 F V-1	PSO-1 SSO-3 SO-5	F F V-

Remarks: The post of CSO has been lying vacant for nearly 3 years (since its creation).

TABLE 7: Foreign Ph. D. under USAID ARP Phase I & II

Phase I				Phase II			
Field	No.	Inst.	Country	Field	No.	Inst.	Country
Horti.Veg.Prod.	1	BARI	USA	Animal Science	1	BARC	PHIL.
Wheat Breed	1	BARI	USA	Pest Mgt.	1	BARI	USA
Soil Science	1	BARI	USA	Agronomy	2	BARC BARI	PHIL. USA
Agril. Econ	2	BARI	USA	Soil Science	1	BARC	PHIL.
Entomology	1	BARI	PHIL.	Breeding	1	BARI	USA
Agron/Cropping	1	BARI	USA	Water Mgt.	1	BAU	USA
Verte.Pest.Mgt.	1	BARI	USA	Agr.Statistics	1	BARC	USA
Total:	8			Total:	8		

SUMMARY

Phase I

Inst.	No.
BARI	8

Phase II

Inst.	No.
BARC	4
BARI	3
BAU	1

TABLE 8: Foreign M.S. under USAID ARP Phase I & II

Phase I				Phase II			
Field	No.	Inst.	Country	Field	No.	Inst.	Country
Crop Production	1	BARI	NIGERIA	Agril.Econ	4	BRRI BARI	2 PHIL. 2 PHIL.
Vert.Pest.Mgt.	2	BARI	PHIL.	Agronomy	7	BARI	5 PHIL. 2 USA
				Plant Breed	1	BRRI	PHIL.
				Plant Patho.	1	BARI	PHIL.
				Research Mgt.	1	BARI	USA
				Soil Science	2	BARI	USA
				Horticulture	1	BARI	USA
				Irri.& Water Mgt	3	BRRI	BANGKOK
						BARI	BANGKOK
						BARC	BANGKOK
				Entomology	1	BARI	PHIL.
				Farm Machinery	1	BARC	PHIL.
				Vert.Pest.Mgt.	1	BARI	USA
Total:	3			Total:	23		

SUMMARY

Phase I		Phase II	
Inst.	No.	Inst.	No.
BARI	3	BARI	17
		BARC	2
		BRRI	4

Table 9: Foreign Short-Term Training Under USAID ARP Phase I & II

Phase I

Inst	No.
BARI	19
BARC	2
Total :	21

Phase II

Inst.	No.
BARI	52
BARC	20
BRRI	1
BAU	23
BADC	1
BINA	4
BWDB	1
BJRI	5
BO	1
DAE	3
DU	8
FRI	1
IFAQ	1
MOA	4
BAI	2
Total :	127

TABLE 14: FOREIGN PH.D. AND M.S. FOR BRRI SCIENTISTS UNDER BRRI/IRRI RICE RESEARCH AND TRAINING PROGRAM, PHASE II

Field	M.S. No.	M.S. Country	Ph.D. No.	Ph.D. Country
Adapt. Research and Training	1	PHIL	-	-
Pathology	3	PHIL	1	USA
Plant Breeding	8	PHIL	3	PHIL
Ag. Engg.	1	PHIL	1	USA
Agronomy	4	PHIL	4	3 USA, PHIL
Entomology	1	PHIL	-	-
Rice Tech.	1	PHIL	-	-
Ag. Econ.	1	PHIL	1	MALAY
Plant Physio.	1	PHIL	1	PHIL
Ext. Ed. and Training	1	PHIL	-	-
Microbiology	1	PHIL	-	-
Cereal Chem.	1	PHIL	-	-
Soil Science	1	PHIL	-	-
Crop Science	2	PHIL	-	-
Irrigation	2	PHIL	-	-
Farming System	1	PHIL	-	-
Applied Research Training	1	PHIL	-	-
Statistics	-	-	1	PHIL
Verte. Pests	-	-	1	USA
TOTAL:	31		13	

TABLE 16: Counterparts (i.e. PSO-In-Charge) discussed usefulness of T.A. Staff

Institute	Usefulness	T.A. Specialist
BARI, RARS Jamalpur	Very useful	Eduardo Pardon, N. Vignarajah
BARI, RARS Hathazari	Very useful	R.N. Mallick
BARI, RARS Jessore	Very useful	L. Villegas
BARI, RARS Ishurdi	Very useful	R. Drew, R.N. Mallick, J. Kumar

Note: T.A. Specialists other than stationed T.A. Specialists visited the outside stations very occassionally.

TABLE 17: RARS SCIENTISTS DISCUSSED THE USEFULNESS OF T.A. STAFF

Institute	Very Useful	Useful	Useless-Mentioned by	
BARI, RARS JESSORE	-	7	1	S.S.O. Agronomy
BARI, RARS JAMALPUR	5	16	1	S.S.O. Agronomy
BARI, RARS ISHURDI	2	8	1	S.O. Workshop & maintenance
BARI, RARS HATHAZARI	2	6	1	S.S.O. Agronomy

TABLE 18: Women Scientists Trained by ARP II

Course/Training	Name	Year	Inst.	Field	Country	Duration
Ph.D.	Parvin Sultana	1983	BARI	Pest Management	USA	48 Months
Short Term	Parvin Sultana	1979	BARI	Vert. Pest Damage Assess.	Phil	2 Mon.
Short Term	Jinnat Ara Begum	1983	BAU	4th Asian Don.on Nuta.	Phil	4 Day
Short Term	Sultana Razia	1984	BARI	Soil & Plant Anly.	USA	5 Mon.
Short Term	Selina Begum	1984	BARC	Mgt. Women Dev.	USA	7 Wks.
Short Term	Nazma Begum	1984	BARC	Proj. Imp. For Ag. and Ru. Dev.	USA	7 Wks.
Short Term	Wasefa Akhter	1984	BARI	Farming Systm.So.Econ.	Phil	2 Mon.

BL

TABLE 19: National Coordinated Cropping/Farming System Research Program Institutes, Sites and Funding Agencies

Institute Site/District	Funding Agency for CSR Site	Date CSR Initiated	Funding Agency for FSR Site	Date FSR Initiated	FSR Funding Duration	FSR Total Budget (Tk.)
BARI						
Coordinated Unit, BARI	-	July 80	IDA	January 86	3 years	1,735,300
Hathazari, Ctg.	USAID/IDA	July 80	IDA	July 85	3 years	1,973,300
Bagherpara, Jessore	USAID/IDA	July 80	IDA	July 85	3 years	1,703,900
Laherikanda, Jamalpur	USAID/IDA	Oct 82	USAID	July 85	3 years	1,988,400
Kalikapur, Ishurdi	USAID	Oct 82	USAID	July 85	3 years	1,906,400
Janakinathpur, Rangpur	USAID	Oct 82	USAID	July 85	3 years	1,067,700
Palima, Tangail	-	-	E&RP	January 86	3 years	1,067,200
Saroil, Rajshahi	-	-	IDA	January 86	3 years	1,117,800
Amirabad, Barisal	-	-	IDA	January 86	3 years	511,600
Panchlia, Sirajgonj	-	-	E&RP	January 86	3 years	1,014,600
Norhatta, Bogra	USAID	Oct 82	E&RP	January 86	3 years	969,800
Badarpur, Patuakhali	-	-	IDA	September 86	3 years	5,025,000
BRRI						
H.Q., Joydebpur	-	-	IDA	January 86	3 years	1,390,000
Sripur, Gazipur	self	1983	IDA	July 85	3 years	1,992,000
BJRI						
Coordinated Unit	-	July 80	IDA	January 86	3 years	1,011,266
Kalampur, Manikganj	USAID/IDA	July 80	IDA	July 85	3 years	1,103,250
Vaskharkhila, K.gonj	IDA	July 80	IDA	July 85	3 years	1,102,450
Kalaipur, Faridpur	-	-	USAID	July 85	3 years	1,196,450
Paglapir, Rangpur	-	-	IDA	January 86	3 years	1,148,450
BAU						
Kazirshiela, Mymensingh	-	-	IDA	July 85	3 years	2,254,000
Noagaon, K.gonj	-	-	USAID	January 86	3 years	1,975,000
Trishal Thana	IDA	July 80	not continued as FSR site			
SRTI						
Ishurdi	IDA	1980	IDA	July 85	3 years	1,663,300
Joypurhat	-	-	IDA	January 86	3 years	1,282,400
Thakurgaon	-	-	IDA	January 86	3 years	1,822,100

Institute Site/District	Funding Agency for CSR Site	Date CSR Initiated	Funding Agency for FSR Site	Date FSR Initiated	FSR Funding Duration	FSR Tot Budget (Tk.)
BLRI						
H.Q. BLRI	-	-	USAID	January 86	3 years	2,393,30
Baghabari, Pabna	-	-	IDA	Not yet started	3 years	2,457,30
Shibgonj, Rajshahi	-	-	IDA	Not yet started	3 years	2,457,30
FRI						
H.Q., Chittagong	-	-	IDA	January 86	3 years	1,894,00
Dinajpur & Shalna	-	-	IDA	Not yet started	3 years	1,427,00
BARC						
Coordinated Unit	-	-	IDA	January 86	3 years	2,500,00

TABLE 20: PL-480 Fund Disbursement for Agricultural Research Operating Expenses (in Million Taka)

Name of Institute	Fund Disbursed in 1983-84	Fund Disbursed in 1984-85	Fund Disbursed in 1985-86	Fund Disbursed in 1986-87	Total
BARI	17.570	14.200	11.180	15.635	58.585
BJRI	3.230	2.140	6.000	8.333	19.703
BAU	2.070	1.760	3.000	2.066	8.896
Livestock	0.600	0.090	3.000	0.700	4.390
Fisheries	0.200	0.050	1.000	1.066	2.316
BFRI	4.230	3.730	7.500	11.333	26.793
Forest Res.	1.240	0.690	2.000	2.666	6.596
BINA	2.700	2.780	3.000	2.866	11.346
DU	-	0.500	-	-	0.500
BIRDAN	-	-	0.800	1.000	1.800
SRDI	-	-	1.000	2.500	3.500
BARC	8.160	5.100	5.500	8.499	27.259
AIS'	-	-	0.500	1.000	1.500
CERDI	-	-	-	0.150	0.150
Livestod Res.	-	-	-	0.374	0.374
Unspecified Users	-	-	1.500	-	1.500
TOTAL:	40.000	31.040	45.980	58.188	175.208

Note: The unspent balance, if there is any, is carried forward for utilization in the next FY

TABLE, 21: Varieties released by the Bangladesh National Seed Board (NSB) for commercial cultivation from 1981-1987

Crop	1981	1982	1983	1984	1985	1986	1987
Rice	Progoti (BR-10) Mukta (BR-4)	Bharoshi (BAU-63)	-	Moyna (BR-12) Gaci (BR-14) Mohini (BR-15)	-	Hashi (BR-17) Shajalal (BR-18) Mongal (BR-19)	Binashail Nizami (BR-20), Niamot (BR-21)
Sugarcane	Ishurdi-16	-	-	ISD-17	-	-	-
Leafy Vegetable	-	-	-	Batisak, Chinasak	-	-	-
Sweet Potato	-	-	-	-	-	Kamala Sundari, Tripti	-
Mustard	Shampad (BAU-M/12)	-	-	Sambal (M-2148)	-	-	-
Fruit (Guava)	-	-	-	Kazi Peyara-1	-	-	-
Soyabean	Davis, Bragg	-	-	-	-	-	-
Radish	-	-	Tasaki-sun Mula-1	-	-	-	-
Gram (Chick-pea)	Hyprosola	-	-	-	-	-	Nabin (P-341)
Brinzal	-	-	-	-	-	Uttara (Rajshahi-3)	
Mungbean	-	-	-	-	-	-	Kanti
Sunflower	Keroni (DS-1)						
Wheat	-	-	Ananda, Barkat, Kanchan, Ambar	-	-	-	Aghrani
Corn	-	-	-	-	-	Barnali, Subra, Khai Butta	
Cotton	-	-	-	-	-	Rupali	
Tobacco	-	-	-	-	-	Sugandi (BAT-2)	
Tomato	-	-	-	-	-	Manik, Ratan	
Cabbage	-	-	-	-	-	Provati	
Jute	-	-	-	-	-		Atompart-38 Falguni Tosha
Groundnut	-	-	-	-	-	-	Baron Badam

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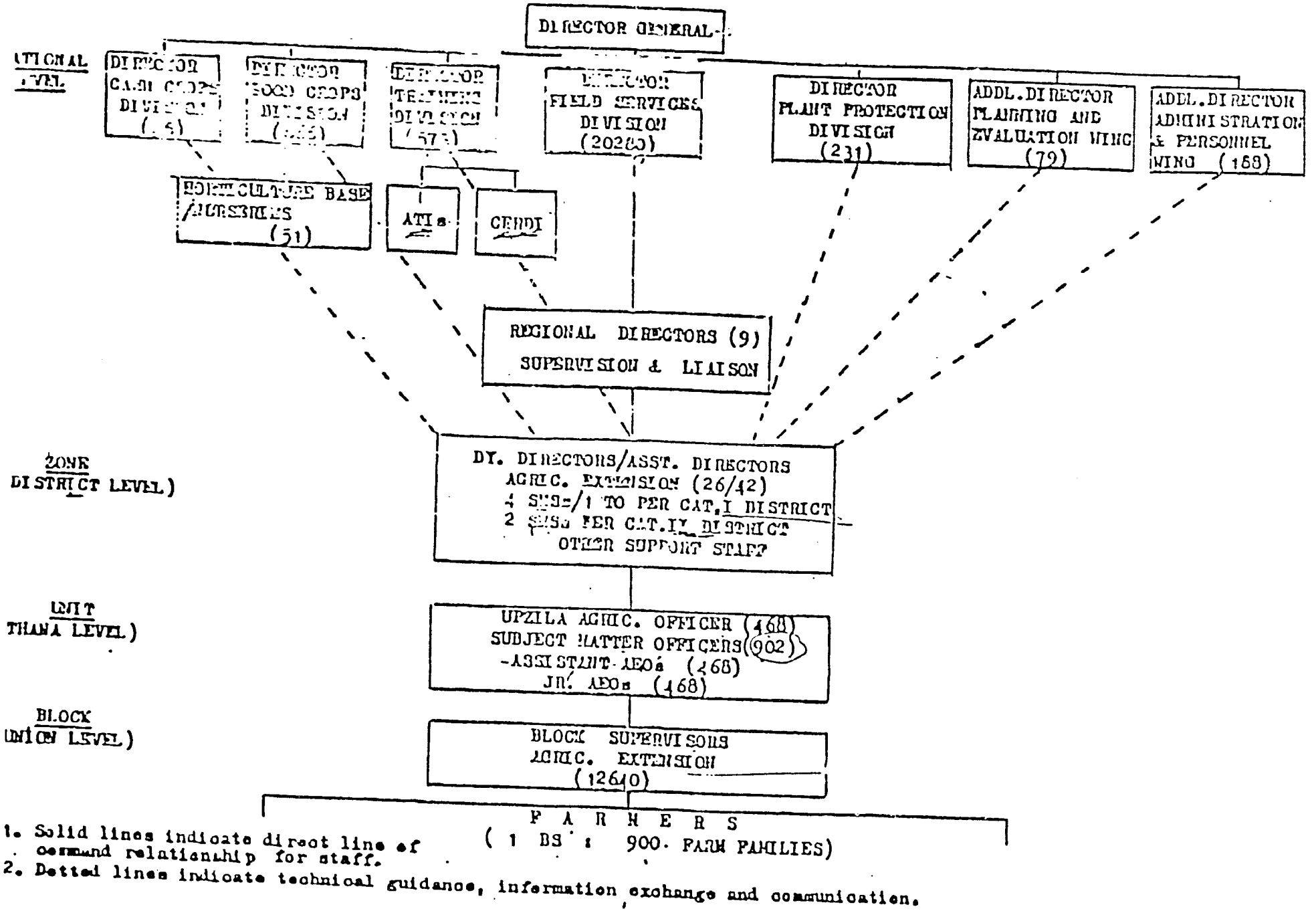
TABLE 22: Improved Technology Developed and in Research Pipelines at the BARI RARS & other Institutes.

Institute	Past Transfer	In Pipelines
BARI,RARS,HATHAZARI	Wheat (Ananda, Barkat, Kanchan, Akbar), Potato(Cardinal), Mustard (SS-75), Country beans, Mango, Guava (Kazi Peyara), Black pepper, Bayleaf, Cinamon, Chilli-Maize interropping, Mulching effect for water conservation, vegetable gardening management, Radish (Tasakisun Mula), Chickpea (Hyprosola)	Hybread variety of Watermelon, new fertilizer (Zn and sulphur), Grean manuring, Seed Storage technology for pulse and groundnut, post harvest technology of potatoes.
BARI, RARS ISHURDI	Wheat (Ananda, Barkat, Kanchan, Akbar) Mustard (SS-75), Radish (Tasakisun Mula), vegetables, Pulses, Maize Sweet Potato, Potato (cardinal), Sunflower and their different production technology and pest management, soyabean (Davis, Bragg) Corn (Barnali, Subra, Khai Bhutta), Cotton (Rupali), Tobacco (Sugandhi)/	Blackgram, Mungbean (Kanti Wheat (Aghrani), Mustard (Sonali Sarisha), Sunflowe (Kironi), Minimum tillage, Relay cropping for wheat and mustard.
BARI, RARS JESSORE	Wheat (Ananda, Barkat, Kanchan, Akbar) Maize (Suvra, Barnali), Tomato (Manik), Ratan, Pinky), Cabbage (Provati), Chickpea (Nobin), Brinzal (Uttara), Radish (Tasakisan Mula), Sweet potato (Cardinal), Pest Control, cultural practices for different crops, cotton (Rupali), Corn (Barnali, Subra, Khai Bhutta).	New fertilizer (Zn & Sulphur), Advanced lines c various crops, cauliflower
BARI, RARS JAMALPUR	Wheat (Ananda, Barkat, Kanchan, Akbar), Mustard (Sonali Sarisha-SS-75, Kallani-TS-72), Groundnut (Basanti badam), Sunflower (Kironi), Radish Tasakisun Mula), cabbage (Provati), Tomato (Manik, Ratan), Brinzal (Uttara)	Wheat Lines-BAW-52, 54 & 5 Mustard (Dhali, Nizer, Comilla-1), Groundnut (Accession-12), Linseed (Lin-1), Saff flower, Chickpea (Sl & Jg.-74), Water requirements for different crops.
SRTI	ISD-16, ISD-17	Seeding transplanting
BRRI	BR-10,11,12,14,15,16,17,18,19	BR-20,21
BAU	Rice-Bharosha (BAU-63) Mustard (Shampad)	Use of Water and increase effectiveness.
BINA	Rice (Binashail)	
BJRI	Atompat-38, Falguni Tosha	Retting Technology.

Table -23: List of Cropping Patterns under Multilocation Test.
OFRD, BARI. (1986-87)

Region :	Cropping Pattern :	MLT Sites
Region - 1 (Ishurdi FSR)	1. B. Aus - Fallow - Lentil + Mustard	Paba, Chatmohar, Sujanagar
	2. Maize + Mungbean - Fallow - Wheat	Paba, Chatmohar, Kashinathpur
	3. Maize - T. Aman - Potato	Kashinathpur, Chatmohar, Paba
(Rangpur FSR)	4. Paintedgourd - GM - Potato+Garlic+	Lalmonirhat, Nilphamari, Gaibandha
	5. Mungbean - T. Aman - Wheat	Lalmonirhat, Nilphamari, Gaibandha
Region - 2 (Jamalpur FSR)	6. T. Aus - T. Aman - Wheat	Melandha, Sherpur
	7. Fallow - T. Aman - Boro	Melandha, Sherpur, Kandua, Netrokona
Region - 3 (Jessore FSR)	8. B. Aus - T. Aman - Potato	Chaugacha, Keshabpur, Jhenaidah Sailkupa, Magura, Narail
	9. B. Aus - Fallow - Mustard	Kalaroa
Region - 4 (Hathazari FSR)	10. Maize - T. Aman - Potato	Satkania, Patiya, Fatikchari
	11. T. Aus - T. Aman - Fallow	Fatikchari, Satkania, Patiya

DEPARTMENT OF AGRICULTURAL EXTENSION
ORGANIZATIONAL CHART



1. Solid lines indicate direct line of command relationship for staff.
2. Dotted lines indicate technical guidance, information exchange and communication.

BARC-BRRI Study, 1986-87: Study on Impact on Adoption and Spread of Modern Varieties on the Overall Production of Rice in Bangladesh

Summary Points of Draft:

1. BRRI was established in 1970 and within a period of seventeen years 21 varieties of HYV rice have been developed with 3 million tons of increased rice production per year at a value of 529 million U.S. dollar.

2. In T. Aman out of 18 HYV, all are BR-varieties which cover 19% area of total T. Aman with 29 percent production out of 36% covered by all HYV T. Aman with production 48.4%. BR-11 alone covers 38% with 45% production and Pajam covers 43% area with 34% production of all T. Aman HYV.

3. In Boro 22 HYV, of which 11 are BR-varieties, covering 51% area with 43% production, out of 78% area and 86% production of total HYV-Boro. Out of 11 BR-varieties BR-3 alone covers 41% area with 32% production. Among other modern varieties BR-8 has occupied 1st position covering 22% area with 27% production.

4. In Aus, 10 are BR-varieties out of 17 modern varieties, which occupies 34% area with 29% production, out of 24% total Aus area with 40% production. Among BR-Aus varieties BR-1, BR-2 and BR-3 together cover 48% of area with 54% production.

5. BBS HYV figures are much below the HYV figures in this adoption study except Boro.

BBS (1985-86)	Adoption Study Report
T. Aman	
Area - 26%	36%
Prod. - 36%	48%
Boro	
Area - 79%	73%
Prod. - 87%	86%
Aus	
Area - 18%	24%
Prod. - 30%	40%

6. Out of 27 modern varieties, 11 varieties are cultivated in all 3 crop seasons. These are BR-1, BR-2, BR-3, BR-8, BR-9, BR-10, BR-11, BR-14, IR-5, IR-8 and Purbachi. Pajam variety is cultivated during T. Aman and Boro season and covers highest area among all HYV rice.

7. Total number of farmers surveyed are 7457. In T. Aman 50% farmers have adopted BR-varieties in 11 years. In Boro season 45% farmers adopted BR-varieties in 16 years while in Aus 23% farmers in 15 years time. The cultivation of BR-varieties started in 1971 but actually it gained speed from 1978.

8. The main reasons for not cultivating BR-varieties are lack of drainage in T. Aman and lack of irrigation in Aus and Boro.

9. The farmers use fertilizers on HYV rice but at slightly lower dose in case of urea and TSP and much lower in case of M.P. Sample farmer did not use zinc and sulphur.

10. The most important source of information about BR-varieties are fellow farmers followed by Block Supervisors (BS). Only 12% of Boro farmers, 15% of T. Aman farmers and 17% of Aus farmers reported that they learned something about cultivation from BS.

11. BR-varieties are performing well in Aus and T. Aman season but not satisfactory in case of Boro. Higher sun-light intensity is good for higher yield but it is reverse in case of BR-Boro varieties. BRRI-scientists are trying to find out solution of this problem.

General Interview schedule for Agricultural Research Station March - April ARP-II Evaluation

Interviewee: (Name/Position): .....

1. Name of Institute:

2. Name of Station, Substation, and FSR Site:

3. What kinds of support has ARP-II provided here?

4. What are the primary areas of research supported by ARP-II at this station, substation, or FSR site? (e.g., improved varieties, new crops, new cropping patterns including intercropping, water management, improved fertilizer use, improved plant spacing or planting time, improved soil preparation, crop pest control, improved storage methods, other farming system components, such as horticulture, fisheries, tree culture., etc.)

5. Are research plans usually initiated from BARI or BRRI Headquarters, or this station, substation, or FSR site? (If both, give proportions.)

6. What kinds of interactions do your research staff have with (Be specific about types of interaction and frequency):

   a) DAE Extension staff: This could include District and Upazila DAE staff, blocks supervisors.

   b) PVC Extension Staff

   c) BADC

   d) Upazila Parishad members

   e) Multilocation testing or Pilot Production Program Staff.

7. What kinds of interactions do your staff have with local farmers (be specific about types of interaction and frequency):

a) Farmer Field days -

b) Training Courses -

c) Crop cuts -

d) Surveys (provide reports of surveys) -

e) Other -

8. What agricultural technologies have been successfully transferred to extension staff or farmers by your staff in recent years?

9. Has there been any measurement of improved farmer yields, productivity, or income (i.e., impact studies) or adoption rates?

.....

.....

.....

What were cases of failure of technology transfer and why did they occur?

9. What technologies are in the pipe line which can be transferred to the farmers soon?

.....

.....

.....

.....

10. What kinds of interactions do your research staff have with:

a) BARI, BRRI, or other Research Institute Headquarters staff

b) Other field research stations, substations, or FSR sites

c) BARC officers.

d) Winrock TA staff (e.g. Production Agronomist or Specialist or short term consultants) (Which specific individuals have you met and how frequently?) What expertise or services were provided?

11. Has this station staff had:

a) Training funded by ARP-II?

b) Adequate journals and books to use as reference materials?

c) Any publications or research reports during the last 3 years?

.....Yes .....No

If yes, specify titles and authors.

d) Any conferences or workshops to report research results?

e) Adequate operational funds?

13. Is this station involved in FSR, ILT, or Pilot Production Programs? Yes..... No.....

If yes, what kind of impact has been made due to any of this:

.....

.....

Are the non-cooperator farmers adopting the same technologies like cooperator farmers at FSR site

Yes..... No.....

14. What changes have been made due to Agricultural Research Project-II funded by USAID?

.....

.....

.....

15. What are the main constraints in doing agricultural research and how to overcome these constraints?

.....

.....

16. As the technicala assistance ends, what do you expect will happen in research and technology transfer at this station?

17. Is DAE doing their job properly? .....Yes .....No

If no, why and what is your suggestion to improve technology transfer system.

.....

.....

18. Are the NGO, PVO, Research Stations involved in technology transfer? Yes..... No.....

19. What is your feeling about the involvement of more PVOs in technology transfer?

..... Good idea ..... Bad idea

Why. .....

VS-0224

Interview Schedule for Bangladeshi Agricultural Researchers
March - April 1987, ARP-II Evaluation

1. Position:

2. Name of Institute:

3. Name of Station, Substation, and FSR Site:

4. Length of Time at this Location:

5. What type of research and/or technology tranfer activities have you been involved in (i.e., your job)?

6. What proportion of your research is designed locally and what proportion is designed at the research institute's headquarters?

7. Have you and colleagues developed any improved technologies that have successfully (or not) been transferred to farmers or extension workers?

8. What kinds of interactions do you have with:

   a) Extension staff (DAE)

   b) Farmers

9. What kinds of interactions do you and research colleagues have with:

   a) BARI, BRRI, or other Research Institute Headquarters staff

   b) Other field research stations, substations, or FSR sites

   c) BARC officers

   d) Winrock TA staff (e.g. Associate or Production Ageonomist or Specialist or short term consultants) (Which specific individuals have you met and how often)?

Have you learned anything from the ARP-II Specialist(s)? (Describe in detail)

What do you think about Specialist Support to you or your station?

.....Very useful .....Useful ..... Useless

Why or in what _____?

10. Have you had

a) Training funded by ARP-II?

b) If yes, duration of Training:.....

c) What have you learned?

11. Adequate journals and books at your station to use as

a) are those reference materials?

b) Any publications or research reports during the last 3 years?

..... Yes ..... No

If yes, specify titles and authors

c) Any conferences or workshops to report research results?

d) Adequate operational funds?

12. What changes have been made here and in the research and technology transfer system due to Agricultural Research Project-II funded by USAID?

.....

.....

15. What do you think about technology transfer?

.....

.....

Is DAE doing their job properly? .....Yes ..... No

If no, why and what is your suggestion to improve technology transfer system

.....

.....

Interviews Schedule for Extension Officials
March-April 1987 - ARP-II - Evaluation

Position

Zilla: .....

Upazilla: .....

1. How often do you visit farmers?

   Once a week .....

   Twice a week .....

   Every day .....

2. If Block Supervisor - How many farmers you are supposed to provide services?

3. What kind of new technologies you are transferring to the farmers?

   .....

   .....

   .....

4. What changes have been made during recent years in agricultural field?

More HYV adoption	-	Yes	No.....
More fertilizer use	-	Yes	No.....
More pesticide use	-	Yes.....	No.....
More Agril. Credit use	-	Yes.....	No.....
More area under irrigation	-	Yes.....	No.....

5. What are Farming System Research (FSR) Sites?

.....

What do they do there?

.....

.....

Have you visited FSR site during last six months?

Yes..... No.....

If yes, how many times.....

What are the new technologies you have learned from FSR site?

.....

.....

.....

.....

Are these technologies beneficial for farmers?

Yes..... No.....

Any farmer adoption these technologies?

Yes..... No.....

If no, why? .....

6. What is Multilocation Testing (MLT) Site?

.....

.....

Have you visited MLT site any time? Yes..... No.....

If yes, how many times.....

7. Are you involved in MLT program? Yes..... No. .....

If yes, how mamy farmers are involved in MLT Site? .....

What new technologies are being tested now?

.....

.....

.....

8. What is Pilot Production Program?

.....

.....

.....

9. Are you getting enough technologies to transfer to the farmers?

.....

.....

10. What are the main constraints to transfer technologies to the farmers?

.....

.....

11. How often do you meet research personnel?

How often do you visit research station/

.....

.....

12. When have you attended training, curse/workshops/seminars/fieldays last time?

VS-0224

Rapid Appraisal of Farmer Knowledge and Adoptions of New Agricultural Technology - March-April, 1987 ARP-II - Evaluation

Interviewer: ..... Size of field landholding.....

Research Site:.....(Within).... Yes...No... Amount of land rented out .....

Farmer's Name..... Amount of land rented in .....

Estimated Age..... Total amount of land managed.....

Household Size ..... Amount of rainfed land .....

Labour Size..... Amount of irrigated land .....

Village..... Type of irrigation system.....

Upazilla ..... Distance from PSR Site.....

Zilla ..... Type of Farmer.....

Cropping Pattern - Rainfed Land: .....

Other Pattern - Rainfed Land:.....

Cropping Pattern - Irrigated Land:.....

Other Pattern - Irrigated Land:.....

1. Are you doing anything differently in farming than you were 5 years ago? Yes..... No .....

If yes to question number 1, answer the following questions.

2. What specific things have you changed? (e.g., HYV, new crops, new fertilizer, more crops per year, better water management, minimal tillage, pesticides, relay crop etc.)

	Rainfed Land	Irrigated Land
Varieties		
(# Years)		
Fertilizer		
((# Years)		
Others		
(# Years)		

3. Are you thinking about making other changes? Why not? (e.g., no money for inputs, risk issues, insufficient labor, fertilizer or seed not available, unreliable irrigation water, market problems).

4. Where did you learn about each of the new technologies (a,b,c)? (possible answers: on-farm trials, research station or Farming System Research Site, field day, Block Supervisor, other farmer's field, Cooperator farmers, PVO, KSS, BADC staff, Fertilizer Dealer, MLT staff, Pilot Production Project).

a.

b.

c.

d.

5. Have your yields increased? What crops (e.g., aus, aman, wheat etc.)? Give examples.

6. Which technological changes has increased your farm income most?

Second?

7. What is the Farming Systems Research Site? What do they do there?

Is it a good thing or not?

8.

	Do you ever go:	Why did you go?	How many times?	Did you learn any thing useful?
a) Research station				
b) Farming system site				
c) Extension meetings				
d) Demonstration Plots:				

1987 AIP-II Evaluation:
Farmer Interview Coding Form

ID _____ SITE _____ CATEGORY _____

LAND _____.____ acres IRRIG _____.____ acres RAINFED _____.____ acres

FARMER TYPE _____ OWN__ PART own _____ rent _____ WATER _____

IRRIGP _____ RAINFP _____ CHANGE Yes __ No __

If relevant, write Local, HYV, Both, or NA:

AUS _____ MUSTARD _____ JUTE _____ AMAN _____ PULSES _____ SCANE _____

BORO _____ VEG _____ POTATO _____ WHEAT _____ CORN _____

PESTICIDE Yes __ No __ NEW __ OTHER _____

If relevant, write one of following sources of information on new crops and new varieties: FSR, MLT, PPP, RARS, DAE, BADC, BARD, NEIGHBOR, SHOP, NA

RICE 1 _____ RICE 2 _____ POTATO _____ RADISH _____

WHEAT _____ SUNFLOWER _____ MUSTARD _____ CORN _____

If relevant, fill in fertilizer used (seres/acre):

AMANUREA _____ BOROUREA _____ AUSUREA _____ WHEATUREA ____ MUSTUREA _____

AMANTSP _____ BOROTSP_____ AUSTSP _____ WHEATTSP_____ MUSTTSP _____

AMANMP _____ BOROMP _____ AUSMP _____ WHEATMP_____ MUSTMP_____

Sources of fertilizer information:
(FSR, MLT, PPP, RARS, DAE, BADC, BARD, DEALER, NEIGHBOR, MULTI, NAO

FERT1 _____ FERT2 _____

Source of Pesticide Info (choose from above):

PEST _____

If relevant, fill in yields (maunds/acre):

AUSLOC _____ WHEATLOC _____ AUSHYV _____ WHEATHYV _____

AMANLOC _____ MUSTLOC _____ AMANHYV _____ MUSTHYV _____

BOROLOC _____ POTATOLOC _____ BOROHYV _____ POTATOHYV_____

Fill in increased yields (maunds/acre) due to HYV, fertilizer, and irrigation:

INC__AUS _____ INC__AMAN _____ INC__BORO _____

INC__POTATO _____ INC__WHEAT _____ INC__MUSTARD _____

TECHIMPACT ----------

Fill in level of contact with the following institutions or programs.
(Responses: NOTHING, HEARD, TALKED W/FARMERS, FIELDDAY, FIELDDAYS, COOPERATOR

FSR _____ RARS _____

MLT _____ PPP _____

If know about FSR, is it useful for farmers? ATTITUDE Yes ____ No ____

Responses for following: NO CONTACT, HEARD, LITTLE CONTACT, REGULAR ASSISTANCE

BSDAE _____ DAE/UP _____ BADC _____

BARD _____ OTHER _____

1987 ARP-II EVALUATION: FARMER INTERVIEW CODE

FIELD NAME	CODES	DEFINITIONS
ID		Interview ID #
REGION	ISHURDI JESSORE JAMALPUR MATHAZ	
SITE	**FSR SITES**	Includes outside FSR
	KALIK	Kalikapur (Ishurdi)
	LAHERI	Laherikanda (Jamalpur-includes
	BAGHER	Bagherpara (Jessore)
	MATHAZ	Mathazari (includes PPP)
	SAROIL	Saroil (Rajshahi)
	JANOKI	Janokinathpur (Rangpur)
	MLT SITES	Includes mainly Coop Farmers
	NARAIL	(Jessore)
	PATIYA	(Chittagong)
	MELANDHA	(Jamalpur)
	BARURA	(Comilla)
	UTTAR_D	Utter Debipur (Dinajpur)
	BODA	(Panchagarh NW)
	DORBUST	(Sylhet)
	CHATMOHAR	(Pabna - substation)
	CONTROL AREAS	
	PANCHA	Panchagarh (Dinajpur)
	COX_B	Road from Cox's Bazaar to Tekna
	PUTIA	(Rajshahi)
	GODAGARI	(15 miles from Saroil FSR, Raja
	NAWABGANJ	(Rajshahi)
	JOYNTHA	Joynthapur (Sylhet)
MILES	.5	# miles from FSR boundary for
	1.0	Out-FSR cases only
	2.0	
	3.0	
	4.0	
	5.0	
CATEGORY	FSR	
	OUT_FSR	Outside FSR site
	PPP	
	MLT	
	CONTROL	
LAND		Amount of field land managed
IRRIG		Amount of irrigated land mged
RAIN		Amount of rainfed land mged.

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FARMTYPE	LANDLESS	Owns 0 - 0.5 acres
	MARGINAL	Owns .51 - 1.25 acres
	SMALL	Owns 1.26 - 2.5 acres
	MEDIUM	Owns 2.51 - 5.0 acres
	LARGE	Owns more than 5.0 acres
OWN_RENT	OWN	Owns all land managed
	RENT	Rents all land managed
	BOTH	Both owns & rents
WATER	STW	
	DTW	
	LLP	
	SHORA	Includes canal system & hills
	MANUAL	Inc don, swing basket, handpump
IRRICP (Irrigated C P)	AMAN	Assume AMAN is transplanted
	AMAN_PULSE	
	AMAN_BORO	
	TAUS_AMAN	
	TAUS_AMAN_R	R= Rabi (veg, pulses, oils seeds)
	TAUS_AMAN_BORO	
	J_AMAN_R	
	BAUS_AMAN	
	BAUS_AMAN_R	
	BAUS_AMAN_WHEAT	
	MAIZE_AMAN_R	
	BRAUS_AMAN_MUST	BRAUS= late Boro or early Aus
	BAMAN_BORO	BAMAN= Broadcast aman (low areas)

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RAINFCP	AMAN	
	AMAN_R	
	AMAN_BORO	
	AMAN_WHEAT	
	AMAN_RE_WHEAT	RE=Relay
	AMAN_RE_PULSE	
	BAMAN	
	BAMAN_RE_PULSE	
	BAMAN_RE_MUST	
	BAUS	
	BAUS_AMAN	
	BAUS_AMAN_R	
	BAUS_AMAN_VEG	
	BAUS_VEG	
	BAUS_WHEAT	
	BAUS_PULSE	
	BAUS_POT_INT	INT=Intercrop with crop befo POT=Potato
	TAUS_AMAN	
	TAUS_AMAN_R	
	TAUS_AMAN_FELON	FELON=Chittegong cowpea
	JUTE_AMAN	
	JUTE_WHEAT	
	JUTE_PULSE	
	JUTE_MUST	
	JUTE_R	
	JUTE_VEG	
	JUTE_POT_INT	=Intercrop with Poteto crop
	KAON_AMAN	Millet
	TIL_AMAN	Sesame
	GM_AMAN	GM=Green Manure
	SUGAR	
	SUGAR_INT	Other crop intercropped w/ sugar
	SUN	SUN=Sunflower

CHANGE	YES NO	changed technology within 5 yrs?
NEW_OTHER		write any other changes made (e.g., LINESOW, INTERCROP, etc.)
TECHIMPACT	FERT IRRIG HYV MULTI	Which tech change increased income the most?

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Level of Contact Questions:

	NOT_KNOWN	Not know about it
	HEARD	Heard about it but not know much.
	CONTACT_COOP	Discussed it with a cooperator farmer or have visited a field o cooperator farmer.
	FIELDDAY1	Attended one fieldday.
	FIELDDAYS	Attended more than one fieldday.
	COOP_FARMER	Is a cooperator farmer in FSR, HLT, or PPP program.
RARS		RARS = Regional Research Station & Research Substations.
ATTITUDE	YES	Is the FSR program useful for farmers?
	NO	
	NA	=Not applicable (i.e.,not know FSR)

A N N E X D

"RICE RESEARCH IN BANGLADESH" BY MUNSHI SIDDIQUE AHMAD

ANNEX D:

RICE RESEARCH IN BANGLADESH

by Munshi Siddique Ahmad

I. INTRODUCTION:

A. Background:

There is no written history of rice cultivation in Bangladesh. Rice is the crop which grows in the country round the year, summer or winter, drought or deepwater, dwarf or very-tall, fine or coarse, glutinous or non-glutinous, in short adapted to all variable land situation, climatic conditions, and tastes of the people. Depending on ecological conditions, four distinct and unique ecotypes have developed over the centuries, and these are: Aus, Boro, Transplant Aman and Deepwater Rice (Broadcast Aman).

B. Area:

The total area under rice is about 10.50 million ha. The areas occupied by Aus, Boro, T. Aman and deep water rice are about 3.10, 1.60, 4.10 and 1.70 million ha., respectively. Rice is grown once, twice or even thrice on an area in one year. The total area occupied by rice is about 77 percent of the total cropped area of about 13.56 million ha. Rice is sometimes referred to as a monocrop, however the four ecotypes, grown in all the seasons, covering so vast a majority area and giving rise to acute and complex problems demand appropriate separate attention.

C. Rice Research:

Rice research was initiated in Bangladesh in 1909. With no production deficit, the research progress was slow and had practically no transfer of technology to the farmers. The increasing population, World War II and the famine of 1943 began the trend of deficits in rice production. Rice research was strengthened during the fifties with the

collaboration of the FAO Rice Commission. Bangladesh joined hands with IRRI through the good offices of the Ford Foundation in 1964. Ric research started to receive new impetus through the technical, financial and breeding material assistance, and training facilities from Ford Foundation and IRRI. In the process of development of rice research, Bangladesh Rice Research Institute (BRRI) was established as a semi-autonomous body in 1970. Subsequently, CIDA, IDRC, Australia and USAID joined with the Ford Foundation, forming a consortium of technical and financial help to build up BRRI as it is to-day. In the meantime, through bilateral agreements, Canada, ODA(UK) and Japan helped Bangladesh develop facilities at BRRI. The World Bank also helped financially in acquiring equipment and machinery through the Cereal Seed Project.

II. ACHIEVEMENTS:

Rice research in Bangladesh is a success story. After the association with IRRI, breeding materials in large numbers were received by BRRI beginning in 1965. Varieties like IR8, IR5, IR20 and BRI (Chandina) and BR2 (Mala) were directly introduced from IRRI materials and recommended as varieties for Bangladesh. In the meantime a Chinese variety, Chen Chu Ai, was renamed Purbachi. Biplab (BR3) was the first variety developed through hybridization at BRRI.

The IRRI concept of high yielding, dwarf varieties soon encountered the challenge of uncontrolled water conditions in Bangladesh. With poor irrigation facilities and most rice being grown under rainfed and deepwater conditions, the expansion in acreage of the modern varieties ofIR8 type was seriously restricted.

BRRI breeders collected evidence in favor of tall plants with high yield potential and started breeding for tall seedling height and intermediate plant height. Brrisail (BR4) with about 125 cms height against 100 cms for IR8, was a great success, particularly suitable for the T. Aman season. It proved superior to IR8 and similar short varieties in yield and quality in the IRTP tests. As of 1987, varieties up to BR21 have been released and about a dozen of these are of intermediate to tall plant type with taller seedlings. About half a dozen are highly popular. In the meantime, BAU and BINA took up rice research programme. By 1987 one variety from BAU was provisionally released and three varieties from BINA were released by the National Seed Board.

The research in other disciplines, such as, agronomy, plant pathology, entomology, soil chemistry and fertilization, water management, agricultural economics, rice based cropping systems, rice technology, adaptive research and training, are closely integrated with plant breeding at BRRI and its five regional research stations. The support service disciplines, such as, plant physiology, agricultural engineering, farm management, statistics and computer services and publication and public relations also work closely with the task forces constituted for the major disciplines.

BRRI's innovative methods and capability for transfer of technology through the research-extension-farmer linkage have established a dynamic trend. BRRI regularly holds a course in rice production training of four months' duration, twice in a year; three weeks rice production training, twice in a year; annual workshops on experiences with modern rice for a week; and annual internal review workshops for a week. These are

attended by research and extension personnel. Seasonal and according to needs, training courses on CSR, IPM, water management, etc., are held several times a year. Field days are organized at the HQ and regional stations seasonally where extension personnel and farmers in large numbers participate. "Rice schools", a training session of about a week, are held in farmers' villages where the research scientists come to live, discuss, and demonstrate the recent rice technologies to the farmers and become aware of the local problems.

Technology demonstrations are held on the farmers' fields all over the country with the cooperation of DAE personnel. Cropping systems research sites, MLT sites and PPP sites on the farmers fields are the regular sequence where the research-extension-farmer interaction takes place. Advanced technology trials on farmers' fields are also important sites for the tripartite interactions.

BRRI uses publications as a dependable medium for communication of its research results. Up to June 1987, there were 86 publications covering annual reports, seminar and workshop proceedings, manuals, etc. A regular quarterly titled Dhan Gabeshana Shamachar (Rice Research Information) and a monthly bulletin are published for the extension personnel.

The impact of these achievements of research and technology transfer has been quite significant. In the first decade of BRRI's participation with the new concept of developing high yield varieties (1965-76), it released 11 modern varieties. The area under modern varieties rose to 1.56 m ha with a production of 3.69 million tons of clean rice in 1975-76. By 1984-85, nine more varieties were added to the list and the area covered was 2.78 m ha with a production of 6.31 million tons,

averaging 2.27 t/ha of clean rice against 1.08/ha of local varieties. Modern varieties in 1984-85 covered more than 27 percent of total rice area and contributed more than 44 percent of total rice production in the country.

III. CONSTRAINTS:

1. Task Force Management:

The task force approach of research management by BRRI was the main tool to integrate the disciplines for conducting research in a programmeme area. The head of a major discipline is the leader of the task force with members from the allied disciplines. Say, for example, the varietal improvement task force made up of the heads of the disciplines of breeding (leader), pathology, entomology, agronomy, cropping system, soil and fertilizer, economics, statistics, adaptive research and training, rice technology, and water-management. The task force evaluates earlier research, identifies the problems, draws up a comprehensive seasonal research programmeme. The task force has been further expanded to include other research organizations, BARC and DAE. With the increase in the size of the task force, the effectiveness has been reduced considerably.

2. Regional Stations:

Regional stations are under-staffed. Transfers are frequent. Qualification and training-wise, station personnel are inferior. Often the stations are used as punishment centers. Regional problems are not properly identified. Generally the stations are used as sub-stations of HQ. The concept of serving the regional needs has not been functioning as desired.

The scientists do not prefer to work at the stations. Working, living, health and education facilities at the stations are not good enough.

3. Varietal constraints:

Many of the modern varieties developed earlier were not adapted to prevailing cropping systems. Adoption of these varieties was not easy. Many of them were late maturing and cropping intensity was affected. Apart from their lack of tolerance to varying water depth, the short varieties were at a disadvantage in straw production compared to traditional varieties. Straw is the primary cattlefeed of the country and the sturdy short straw was also less palatable. Most of the new varieties had coarse grain with a low market value as compared to traditional varieties. T. Aman season commanding about 40% of the total rice area continues transplanting rice from July to the end of September, and local varieties are photo-sensitive to fit the September transplanting. Modern varieties being weakly sensitive are generally suitable for transplanting only up to the end of August when about 40% of the area still remains to be transplanted. Till recently (1987) there was no recommended modern variety suitable for Broadcast Aus season (about 2.5 m ha) and still there is no modern variety for deep water conditions (about 1.70 m ha). Whereas modern T. Aman varieties may be transplanted up to 30 cms depth of flood water, local varieties may be transplanted up to 60 cms depth of water. In the coastal region local varieties are more tolerant to salinity and tidal submergence. Considering all these constraints the modern varieties so far developed may be suitable for about 60% of the total rice area.

4. Resistance to disease and insects:

Varietal resistance to diseases and insects, as were claimed at the time of recommendation, are not holding up in the farmers' fields. None of the varieties so far recommended was developed through systematic resistance breeding, and in most cases the claims of the resistance were made on chance observations. Genetics of susceptibility to diseases and insects has not yet been systematically studied.

5. Adoption constraints:

It is estimated that the varieties so far developed have the potential for covering about 60% of the total rice area. But in reality, the coverage by 1984-85 was slightly over 27% and the rate of expansion is slow. There is no denying of the fact that the varietal constraints have been contributing to the slow expansion.

The socio-economic conditions of the farmers are also not conducive to the desired coverage. About 70% of the farmers are subsistence farmers and in fact most of them live below subsistence level. It is hard for them to invest in modern technology. Modern varieties involve more cash investment in fertilizer, pesticides and irrigation. Many farmers cannot afford these.

Bank loans are available but the illiterate farmers are often cheated and they are afraid. Their land size is also not economic holdings for intensive investment. As a result, losses are inevitable and the poor become poorer. These conditions negatively influence the expansion of modern technologies.

Modern technology is complex enough to require a minimal farmer education level to deal with it. For the desirable benefit the knowledge for computation of fertilizer, pesticides and irrigation for different sizes of land holdings, and different stages of growth is essential.

2. The regional stations' responsibilities should be well defined in the context of the agro-ecological zones (AEZ) it represents. The problems of the AEZ should be thoroughly surveyed and research programme formulated. On the basis of priority problems the stations should be staffed with appropriate personnel. Service at the stations should be made more attractive so that vacancies do not continue to affect research programme.

3. Varietal constraints mentioned in section III/3 should receive breeding priority. Varieties should be developed in relation to the existing and probable cropping systems.

4. Rice based cropping systems research should include non-rice crops, both under irrigated and non-irrigated conditions. Fertilizer and pest management (IMP) should be integrated with CSR for relevant recommendations.

5. Systematic resistance breeding against diseases and insects should be undertaken and supported by adequate genetic studies.

6. Effectiveness of the T&V system for extension of modern technology should be evaluated, and if necessary, factors/measures to ensure effectiveness should be included.

7. Farmer's formal education is highly important for agricultural development and has to be assured.

6. Extension constraints:

Technology demonstration has been a very effective way of technology transfer. Due to the upazila system it has been practically stopped for want of funds from the upazila administration.

The technology transfer linkage through the cropping systems research (CSR) has suffered a set-back by the introduction of the FSR concept. The new concept has not made any headway but has blocked the process of CSR.

The efficiency of the T&V system of extension is questionable. Theoretically, and when it is considered that everybody is dutiful, the T&V system seems alright. In practice, however, there is no mechanism for making everybody dutiful. As such, the extension of better technology is limited.

IV. RECOMMENDATIONS:

1. The constraints in the research system management should be eliminated as far as possible. The task force concept with its increasing size has outlived its desired efficiency. Smaller interdisciplinary and specific-problem area (not programmeme area) working scientists should form working groups. For example, for developing a BPH resistant variety, breeders and entomologists working with the problem should be named to form a BPH resistant variety working group. Beside preparation of a formal working programmeme for each season, with job specifications for the members, the members should interact frequently and informally in the research fields, screen houses, laboratories and in farmers fields.

A N N E X E

CROPPING SYSTEMS/FARMING SYSTENS RESEARCH SITES

ANNEX E Cropping systems/farming systems research sites, their year of initiation, soil texture, organization, farm size, location and rainfall, Bangladesh, 1987

Sl. No.	Cropping/farming system research site	Year of initiation	Soil texture	Organization	Farm size (ha)	District	Annual rainfall (mm)
1	2	3	4	5	6	7	8
1.	Bhogra* (R)	1976	CL	BRRI	1.75	Dhaka	2098
2.	Salna* (I)	1976	CL	"	1.47	Dhaka	2098
3.	Laskarchala*(I)	1976	CL, SCL	"	1.47	Dhaka	2098
4.	Jarunbari* (I)	1977	CL	"	-	Dhaka	2098
5.	Daudkandi* R&I	1979	-	"	0.9	Comilla	2117
6.	G.K. Project I*	1979	-	"	-	Kushtia	1600
7.	Alimganj* R	1979	C-CL	"	1.35	Rajshahi	1426
8.	+Sreepur	1985	-	"	-	Gazipur	2098
9.	+ Ishurdi R	1980	S-L-C	SRTI	-	Pabna	1568
10.	+ Joypurhat	1985	-	"	-	Joypurhat	2368
11.	+ Thakurgaon	1985	-	"	-	Thakurgaon	2152
12.	+ Trishal R&I	1980	SL,SCL	BAU	1.07	Mymensingh	2238
13.	Bahadurpur*	1978	SL	BAU	-	Mymensingh	2238
14.	+Kazirshimla	1985	-	BAU	-	Mymensingh	2238
15.	+Kishoreganj	1985	-	BAU	-	Mymensingh	2238
16.	+Kalampur R	1980	CL-L	BJRI	0.4	Dhaka	2098
17.	+Vaskarkhilla R&I	1980	S	"	0.5	Kishoreganj	2433
18.	+Kanaipur R&I	1983	-	"	-	Faridpur	1991
19.	+ Paglapir	1985	-	"	-	Rangpur	2368
20.	+Thakurgaon* I	1980	SL,CL	BWDB	1.7	Thakurgaon	2152
21.	+ DND * I	1978	-	BWDB	-	Dhaka	2098
22.	Nather Petua R	1980	-	MCC1/	-	Comilla	2117
23.	Teuaga R	1980	-	MCC	-	Comilla	2117

24. Charbata	1979	SCL	MCC	-	Noakhali	2117
25. +Hathazari R&I	1980	L-SCL	BARI	0.27	Chittagong	2865
26. +Bagerpara R&I	1980	-	"	1.47	Jessore	1765
27. +Laharikanda R&I	1983	-	BARI	-	Jamalpur	1938
28. +Kalikapur R&I	1981	SL-CL	"	1.32	Pabna	1588
29. +Janokinathpur R	1981	SL°	"	1.09	Rangpur	2368
30. +Godagari R	1982	C-CL	"	1.35	Rajshahi	1462
31. +Kahaloo R&I	1981	C-CL	"	1.47	Bogra	1557
32. +Tangail R&I	1984	-	"	-	Tangail	1938
33. + Serajganj R&I	1985	-	"	-	Serajganj	1588
34. + Barisal R&I	1985	-	"	-	Barisal	2050
35. + Lebukhali	1986	-	"	0.8	Patuakhali	3067
36. Kalamganj I*	1979	.	HEED 2/	-	Sylhet	4280
37. Gournadi *	1979	S	NCCB	-	Barisal	2050
38. Anantabala * R	1980	C-CL	CRWRC 3/	0.6	Bogra	1757
39. Kathom * R*I	1980	C-CL	CRWRC	0.6	Bogra	1557
40. +Charkai **	1987	-	FRI	-	Dinajpur	2152
41. +Charatijani	1987	-	FRI	-	Tangail	1938
42. +Banderban **	1987	-	FRI	-	Bandarban	2865
43. +Salna	1987	-	FRI	-	Dhaka	2098
44. + Baghabari	1987	-	BLRI	-	Pabna	1588
45. + Sibganj **	1987	-	BLRI	-	Rajshahi	1426

R = rainfed
I = irrigation,
L = loam,
C = clay,
S = silt.

+ FSR approach activities initiated,
" BARI II, BJRI-4, FRI-I, SRTI-3, BAU-2
BLRI-2, BRRI-I, Total = 24

* Phased out.
** Initiation process.

1/ MCC = Mennonite Central Committee
2/ HEED = Health Education and Economic Development
3/ CRWRC = Christian Reformed World Relief Committee.

Adapted from: M.H. Khan, M.A. Razzaque and M.N. Mallick, Progress in Farming Systems Research in Bangladesh, BARC, Sept. 1987.

A N N E X F

LIST OF VARIETIES DEVELOPED BY THE RESEARCH INSTITUTES, 1981-1987

ANNEX F

LIST OF VARIETIES DEVELOPED BY THE RESEARCH INSTITUTES, 1981-87

Crop	Variety	Year of Release	Institutions
Rice	Progati(BR10)	1981	BRRI
	Mukta(BR11)	1981	BRRI
	Bharasa(BAU-63)	1982	BAU
	Moyna(BR12)	1984	BRRI
	Ghazi(BR14)	1984	BRRI
	Mohini(BR15)	1984	BRRI
	Shahibalam(BR16)	1984	BRRI
	Hashi(BR17)	1986	BRRI
	Shahjalal(BR19)	1986	BRRI
	Mongal(BR19)	1986	BRRI
	Nizami(BR20)	1987	BRRI
	Niamat(BR21)	1987	BRRI
	Binasail	1987	BINA
Wheat	Ananda(BAW18)	1983	BARI
	Kanchan(BAW28)	1983	BARI
	Barkat(BAW39)	1983	BARI
	Akbar(BAW43)	1983	BARI
	Aghrani(BAW38)	1986	BARI
Jute	Falguni Tosha	1987	BJRI
Sugarcane	ISD16	1981	SRTI
	ISD17	1984	SRTI
Cotton	Rupali(BAC7)	1986	BARI
Mustard	Sampad(M/12)	1981	BAU
	Sambal(M248)	1984	BAU

Crop	Variety	Year of Release	Institutions
Ground nut	Baman Badam(DM1)	1987	BARI
Sesame(Til)	T1158077	1986	BARI
Gram Hiprosola	1981	INA	
	Nabin(P841)	1987	BARI
Sunflower	Kironee(DS1)	1982	BARI
Radish BARI	Tasaki San Mula 1		1983
Leafy vegetables	Gima Kalmi	1983	BARI
	Bati Shak	1983	BARI
	China Shak	1984	BARI
Guava	Kazi Peyara 1	1984	BARI
Sweet potato	Kamala Sundari	1986	BARI
	Tripti	1986	BARI
Maize	Barnali(BM1)	1986	BARI
	Shuvra(BM2)	1986	BARI
	Khai Bhutta(BM3)	1986	BARI
Tobacco	Shugandhi	1986	BARI
Tomato	Manik	1986	BARI
	Ratan	1986	BARI
Cabbage	Provati	1986	BARI
Mung	Mubarikh	1982	BARI
	Kanti(Mug2)	1987	

SOURCE: BARC

A N N E X G

PRODUCTION OF FOOD GRAINS IN BANGLADESH, FY 1971-FY 1988

ANNEX G

Table: 1

PRODUCTION OF FOODGRAINS IN BANGLADESH, FY1961—FY1988 ['000 metric tons]

FY\Grns	Class of Rice			All Rice	Wheat	All Grains	Total Population [Millions]	Per capita grain prod. [In Kg]
	Aus	Aman	Boro					
1961	2,537	6,680	455	9,672	33	9,704	56.2	172.7
1962	2,365	6,759	493	9,617	40	9,657	-	-
1963	2,237	6,143	490	8,870	45	8,915	-	-
1964	2,700	7,407	517	10,624	35	10,659	-	-
1965	2,541	7,378	580	10,500	35	10,535	-	-
1966	2,965	6,908	628	10,501	36	10,537	-	-
1967	2,717	6,014	844	9,575	59	9,634	-	-
1968	3,118	6,921	1,132	11,172	59	11,231	-	-
1969	2,726	6,980	1,638	11,344	94	11,438	-	-
1970	3,011	7,062	1,934	12,006	105	12,111	-	-
1971	2,909	6,007	2,227	11,143	112	11,255	-	-
1972	2,379	5,787	1,766	9,931	115	10,046	-	-
1973	2,310	5,677	2,103	10,089	91	10,181	-	-
1974	2,847	6,807	2,256	11,909	111	12,020	76.4	157.3
1975	2,905	6,096	2,286	11,287	117	11,404	78.5	145.3
1976	3,282	7,158	2,323	12,763	219	12,981	79.9	162.5
1977	3,059	7,017	1,677	11,753	259	12,012	81.8	146.8
1978	3,153	7,541	2,275	12,969	355	13,324	83.7	159.2
1979	3,341	7,548	1,960	12,849	494	13,343	85.6	155.9
1980	2,854	7,420	2,466	12,740	823	13,563	87.7	154.7
1981	3,289	7,963	2,631	13,882	1,092	14,975	90.8	164.9
1982	3,270	7,209	3,152	13,630	967	14,598	93.2	156.6
1983	3,067	7,603	3,546	14,216	1,095	15,311	95.6	160.2
1984	3,222	7,936	3,350	14,508	1,211	15,719	98.1	160.2
1985	2,783	7,931	3,909	14,623	1,464	16,087	100.6	159.9
1986	2,827	8,540	3,670	15,037	1,042	16,079	103.1	156.0
1987	3,129	8,267	4,010	15,406	1,091	16,497	105.7	156.1
1988p	2,750	6,500	4,740	13,990	1,480	15,470	108.3	142.8
Annual trend growth rate [%]: /*								
1961-86	0.91	0.79	8.92	1.82	18.33	2.17	2.53	-0.26
1974-86	-0.15	1.83	5.80	2.20	24.62	2.93	2.56	0.36
1976-86	-1.34	1.23	8.50	2.13	14.93	2.75	2.69	0.06
1961-86	-3.35	1.36	6.65	1.82	3.22	1.94	2.58	-0.62
1982-87	-1.73	2.99	4.26	2.28	1.85	2.26	2.55	-0.28

/* Trend growth rates are computed using the semi logarithmic trend equation fitted to the time series data based on the least squares method.

/p BDG projection as of Oct'87. /- Reliable data not available.

Data source: BDG Food Directorate; World Bank; BBS Bulletin; USAID,Dhaka.

A N N E X H

YIELD PER ACRE FOR PRINCIPAL CROPS IN BANGLADESH, 1973-1987

ANNEX H

YIELD PER ACRE FOR PRINCIPAL CROPS IN BANGLADESH, 1973-87 [Maunds per acre]/*

Crops\FY	Average 1973-76	Av rage 1977-80	1981	1982	1983	1984	1985	18	1987e
Rice	12.58	13.58	14.60	13.10	14.60	14.53	14.64	16.07	15.81
-Aus	9.68	10.63	11.50	11.30	10.50	11.10	10.35	10.72	11.79
-Aman	12.33	13.73	14.30	13.00	13.80	14.30	14.97	15.27	14.47
-Boro	22.53	21.76	24.60	26.20	26.60	25.90	26.95	25.45	25.99
Sugarcane	473.38	481.73	480.90	480.50	481.30	452.90	455.73	442.30	447.13
Potato	101.53	103.05	107.00	110.90	113.20	114.70	122.78	108.50	107.16
Wheat	10.95	19.60	20.00	19.60	22.90	25.00	23.41	20.63	19.82
Oilseeds/a	8.28	8.45	8.70	0.00	9.34	9.86	7.59	10.18	7.50
Pulses/b	7.88	7.43	7.00	7.20	7.70	7.50	8.13	9.64	12.32
Tea	8.33	9.23	9.80	9.31	10.00	10.30	9.26	10.45	-
Tobacco	9.63	9.70	10.00	10.60	10.50	10.00	10.35	9.38	-
Jute	14.03	15.40	15.70	16.00	17.10	18.20	14.97	15.81	16.86
Papaya	88.78	81.73	90.00	87.20	90.90	93.10	88.46	89.41	-
Pineapple	101.83	105.28	115.20	115.40	114.80	107.60	107.26	104.75	-
Mango	77.98	59.23	50.40	43.90	46.40	38.40	38.93	36.70	-
Cabbage	80.75	86.68	84.60	86.20	86.30	88.75	91.43	91.35	-
Cauliflower	73.35	74.98	77.00	81.40	83.40	83.90	87.39	85.46	-
Jack-fruit	116.55	113.60	109.50	108.00	108.40	106.30	107.54	105.28	-
Banana	169.30	169.38	175.80	175.00	177.00	175.00	184.85	181.90	-
Spices/c	22.68	21.03	18.08	20.97	21.60	21.38	24.65	21.43	-

/a Includes: til, rape & mastard, groundnut, linseeds, coconut, castor, sunflower, and others.
/b Includes: gram, arhar, mung, masur, mashkalai, khesheri, garikalai, motor, and others.
/c Includes: chillies, onion, garlic, turmeric, ginger, corriandar seeds, and other condiments and spices.
/* 1 maund = 82.28lbs = 37.32kgs. /e BBS estimates as of Apr'87.
Data source: World Bank reports #6616(ii),1987, P.50, #5409(iv), 1985, P.63; BBS, Yearbook'85, P.296; BBS, Monthly bulletin, Apr'87, P.24 (figures converted).

A N N E X I

AN ANNOTATED OUTLINE FOR TERMS OF REFERENCE FOR EVALUATING AGRICULTURAL, LIVESTOCK, FISHERIES AND FORESTRY RESEARCH IN BANGLADESH

ANNEX I

AN ANNOTATED OUTLINE FOR TERMS OF REFERENCE FOR EVALUATING AGRICULTURAL, LIVESTOCK, FISHERIES AND FORESTRY RESEARCH IN BANGLADESH

by Lloyd Clyburn*

I. INTRODUCTION:

It is appropriate for the Government to examine its institutions to know whether their purposes remain valid, whether they are responding effectively to their mandates and what, if any, constraints they face in fulfilling their purpose. An appraisal of the appropriateness and performance of the several research institutions would require a great amount of effort. Before undertaking such an exercise, the Government should resolve to make use of the findings.

II. EVALUATION OF RESEARCH TO DATE:

Normally, this should be the second step in the process. But since the value of agricultural research has been questioned, we put it first.

A. Inventory of Research Resources:

For each institute and BAU:

1. Land, buildings and equipment
2. Personnel

* Experience, Incorporated
Washington, D.C., 1987

B. Benefit: Cost Analysis of the Research Performed by the Institutes:

Credit the present value of incremental production over the life of the research programme to all development inputs -- research, extension, water management and fertilizer -- then disaggregate it among those variables. Compare the credit to research to the investment in research and express the quotient as a ratio of benefits to cost.

Discuss research by each institute in terms of,

(1) payoffs to date

(2) potentials for payoff, considering constraints

III. DETERMINING THE RESEARCH NEEDS FOR THE FUTURE:

A. National Requirements of Agricultural, Forestry and Fisheries Commodities:

Show the food, fisheries, forest products and foreign exchange required by the population over time.

B. Analysis of the Feasibility of Meeting Needs:

1. Quantify and evaluate the requirements for meeting the needs. Examples:

(1) intensification of land use

(2) increased productivity of crops

(3) increased productivity of water (fish, etc.)

2. Describe and quantify the present constraints to meeting the above stated needs.

3. Descriptively, geographically, and quantitatively, identify the constraints that can be resolved by research. This will reveal the kind and location of research and the level of effort required.

IV. REALLOCATION OF RESOURCES:

The exercises proposed above may reveal a need to rearrange priorities among commodities, agro-ecological zones, interventions, methods and levels of effort.

V. COMPLETION OF THE RESEARCH COMPLEMENT:

The exercise would reveal:

(1) Research is or is not beneficial in increasing agricultural production.

(2) More, the same or less resources are required for the research establishment to support production requirements. If additional resources are required, describe and quantify them geographically.

VI. ORGANIZATION AND PROCEDURE:

A. Method:

There are two approaches to institutional evaluation:

1. External evaluation:

Typically in the developing countries, the Government retains a "team" of expatriates, generally Westerners, to evaluate their institutions. The "team" usually judges what it sees against criteria drawn from their experience. They state their judgements and "what should be" in a report and go away. Only rarely are such reports useful to the Government requesting them. The political stability of any national institution is far greater than the words of strangers.

B. Self-Evaluation:

An alternative to the external approach is one where the Government and the institutions look at their own. We recommend self-evaluation.

C. Organization:

We recommend an interagency committee chaired by the Secretary of the Ministry of Planning. We recommend retaining one person, skilled in institutional evaluation, as executive secretary to the committee. His staff would be seconded from the ministries involved, who are presently engaged in planning and/or research. A few Bangladeshi consultants would be required, long-term. A few expatriates might be required, short-term.

D. Time Frame: One year.