PD-ABE-393

A.I.D. EVALUATION SUMMARY PART I

(BEFORE FILLING OUT THIS FORM, READ THE ATTACHED INSTRUCTIONS)

IDENTIFICATION DATA

A. REPORTING A.I.D. UNIT: USAID/Bangladesh (Mission or AID/W Office) (ES#)

B. WAS EVALUATION SCHEDULED IN CURRENT FY ANNUAL EVALUATION PLAN? yes ☒ slipped ☐ ad hoc ☐

Eval. Plan Submission Date: FY 90 Q ___

C. EVALUATION TIMING: Interim ☒ final ☐ ex post ☐ other ☐

D. ACTIVITY OR ACTIVITIES EVALUATED (List the following information for project(s) or program(s) evaluated; If not applicable, list title and date of the evaluation report)

Project #	Project/Program Title (or title & date of evaluation report)	First PROAG or equivalent (FY)	Most recent PACD (mo/yr)	Planned LOP Cost ('000)	Amount Obligated to Date ('000)
388-0051	Agricultural Research Project - II	1981	6/93	46,500	46,500

ACTIONS

E. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

Action(s) Required	Name of officer responsible for Action	Date Action to be Completed
Policy changes and research system management:		
1. The BARC and the NARS expedite the completion of the Five Year Master Plans and the information management systems for the Agricultural Research Institutes (ARIs), according to the guidelines developed by BARC and ISNAR. This recommendation is made to focus ongoing and future donor and Government resources on the most effective programs and opportunities for agricultural research and technology transfer. (Report, A-I & II, B-1, B-3; p. 8).	BARC, NARS, ISNAR	09/30/1992
2. There is insufficient BDG funding for the NARS; the BDG increase progressively its contribution to the NARS budget through its Annual Development Plan or other appropriate means. (Report, E-9; p. 15). The target be to increase Government funding support to the NARS to not less than 1.5 percent of agricultural GDP in 7 years. (Cont'd ....2)	MOA, BARC	01/31/93

(Attach extra sheet if necessary)

APPROVALS

F. DATE OF MISSION OR AID/W OFFICE REVIEW OF EVALUATION: mo___ day___ yr___

G. APPROVALS OF EVALUATION SUMMARY AND ACTION DECISIONS:

	Project/Program Officer	Representative of Borrower/Grantee	Evaluation Officer	Mission or AID/W Office Director
Signature				
Typed Name	D. H. Morton	MSU Chowdhury	H. Paul Greenough / J. Rockliffe-King	M. C. Kilgour
Date:	7/8/92	15/8/92		8-1-92

H. EVALUATION ABSTRACT (do not exceed the space provided)

ABSTRACT

The purpose of this evaluation was to assess the influence of project activities 1988-91 on the effectiveness of the research output of the Bangladesh Agricultural Research System and its main coordinating body, the Bangladesh Agricultural Research Council.

In general it was found that the five separate contracting elements made significant contributions, related well to their counterparts, and fulfilled most of their TOR requirements effectively. Many of these contributions have had current and obvious value, while others are in the form of useful management tools or guidelines to be appreciated in the future. The contract personnel endured periods of severe storms, floods, political stress, and several changes of USAID Project Managers.

The project was probably too comprehensive to be effectively monitored by the USAID Food and Agricultural Office staff; contained too many targets of a diffuse nature; and failed to address the root problem of the NARS and BARC. The BARC and NARS have been evaluated 7 or 8 times in the past decade generating reams of reports and hundreds of recommendations, but the limiting factors still remain.

The excessive bureaucratic organization; top-down managerial style; oppressive personnel policies; lack of imaginative leadership; and failure to involve the scientists in policies and planning matters seriously constrain the quality, quantity, and rate of research output in Bangladesh. This evaluation team listed more than 90 critical recommendations--the majority of which must be addressed by the Government of Bangladesh with guidelines from the donor community. The race between population and food security in Bangladesh is urgent and the luxury of slow change may not be a viable alternative.

COSTS

I. EVALUATION COSTS

1. Evaluation Team Name	Affiliation	Contract Number OR TDY Person Days	Contract Cost OR TDY Cost (US$)	Source of Funds
Dr. George Marlowe	TRD	43	127,659.64	ARP-II
Dr. Carl Pray		30		
Dr. Daniel L. Galt		30		
Dr. A. U. Chowdhury		40		
Mr. S. A. Wahed		40		

2. Mission/Office Professional Staff Person-Days (estimate) 40

3. Borrower/Grantee Professional Staff Person-Days (estimate) 50

Continuation Sheet

E. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR Action(s) Required	Name of officer responsible for Action	Date Action to be Completed
3. Dynamic, committed leadership in BARC and in the NARS is the highest immediate priority and the GOB take steps necessary to: (a) appoint permanent (vs. "acting") chief executive officers for the NARS, i.e., an Executive Vice Chairman of BARC and Directors General of several ARIs; and (b) and improve its personnel policies as recommended by the Evaluation (Report, B-1, B-2; p. 8).	MOA	September/1992
Core research development:		
1. An External Evaluation of BARI be conducted utilizing ARP-II-(S) funds during the first or second quarter of USG FY 1993, (Report, A-1, B-3, C-1, C-2, C-4, C-5; pp 7-10).	BARI, BARC, USAID	March/1993
2. An environmental assessment of agricultural development decisions and research and technology transfer become incorporated into more of the NARS research planning and programs,(Report, C-3, C-5; pp 10-11).	BARC, NARS	On-going
3. BARC, the NARS, other relevant Government organizations and the private sector develop ways and means to facilitate the participation of the private sector in research planning and in the implementation and monitoring of research projects and programs. Competitive research grants for the private sector should be investigated as one possibility. (Report, C-4; p.10).	BARC, NARS	On-going
Farming systems research (FSR):		
1. BARI evaluation noted above include an assessment of the farming systems research of BARI's On-Farm Research & Development (OFRD) program which encompasses about 60 percent of the FSR conducted in the country, (Report, D-1 through D-12; pp. 11-13).	BARC, BARI	March/1993
Human Resource Development:		
1. The National Manpower Needs Plan be completed before the PACD of ARP-II-S as stipulated in USAID's Project Paper, (Report, E-1, E-3 through E-6, E-8; pp 13-15).	BARC, ISNAR	PACD
2. The personnel policies, procedures and guidelines employed by different Government agencies engaged in agricultural research and technology transfer be revised by the BDG to create a uniform policy that demonstrably improves the recruitment, retention and performance of NARS scientists and managers, (Report, B-1, B-2, B-5; pp 8-9; E-1, E-2, E-3, E-5; pp 13-14.	MOA, BARC	09/30/1992

A.I.D. EVALUATION SUMMARY PART II

J. SUMMARY OF EVALUATION FINDINGS, CONCLUSIONS AND RECOMMENDATIONS (Try not to exceed the 3 pages provided)
Address the following items:

- Purpose of activity(ies) evaluated
- Purpose of evaluation and Methodology used
- Findings and conclusions (relate to questions)
- Principal recommendations
- Lessons learned

Mission or Office: USAID/Bangladesh

Date this summary prepared: February, 1992

Title and Date of Full Evaluation Report: Progress Evaluation, Agricultural Research Project, Phase -II - Supplement, February, 1992

SUMMARY

RESEARCH SYSTEM MANAGEMENT

During the past 15 years Bangladesh has had its agricultural system reviewed seven or more times, and has had more than 100 agricultural projects implemented within its borders by a variety of donors. Numerous management tools have been developed, many individuals have been trained, and shelves of suggestions for structural and program improvements generated. The BARC and the NARS are far from perfect institutions, but they serve valuable roles. Most of the rate, output, and qualitative limiting factors within the system were beyond the scope of the Project as they related to policy matters which must be addressed by the GOB.

Repressive personnel policies fail to recognize that creative scientists must be measured by a different yardstick than clerical workers, and that slow or no response to written requests and delays in equipment procurement, and top down administrative policies frustrate the creative process and reduce output.

During the past two years, many effective, state of the art management tools have been prepared to help BARC and the NARS develop better strategic planning instruments, more effectively assess priorities, standardize research reporting, network information and personnel systems. The Project has been active in assisting in the development of these tools; in fact, one senior scientist felt that there has been too much dependence on expatriate assistance and that more of the inputs should have been Bangladeshi.

Many of the fine tools are little known or understood by the research scientists thus far, so serious effort must be made to move the new innovations beyond the halls of BARC and offices of the Director at the Research Institutes. Most of the scientists felt that they should have been asked for their inputs into these tools which are to be so vital to their future performance.

Another significant development during the ARPII (S) period that could have tremendous impact on Bangladesh agriculture is the major change in the curriculum at BAU. BAU is one of the major sources of manpower for future extension, research and agribusiness employment. The narrow track curriculum has been opened to include a wider range of courses for each of the specialties, which will help the graduates to be able to operate more effectively in a more diverse, holistic and market oriented agriculture.

The Farming Systems Research approach has modified the thinking of researchers in nearly all disciplines in Bangladesh, by helping them to become more sensitive to the clientele they serve, the importance of relating to the business of agriculture and to be more aware of their accountability to generate technology that may help improve the nutrition and economic outlook of Bangladesh.

CORE DISCIPLINE IMPACTS

Overall, the evaluation team found that the ARPII (Supplement) specialists performed their assigned tasks well under the circumstances of project implementation. The core discipline impacts of the ARPII (Supplement) can be summarized as follows:

1. The Chief of Party/Human Resources Development Specialist functioned as an effective administrator and liason between BARC and the various Research Centers, and interfaced exceptionally well with the enterprise side of small holder farmers and industry support groups.

2. The Research Systems Management Specialist provided valuable support to BARC in the development of a wide variety of research management tools such as planning, prioritizing, evaluating, reporting, and networking instruments. This specialist also strengthened linkages between BARC and International Service for National Agricultural Research.

3. The Agricultural Economist made several long term impacts in the development of a Social Scientists Network which may help insure the presence of socio-economic inputs into planning, the introduction of a cost effective, comprehensive manual on Rapid Rural Appraisal in FSR, and enhance training in the analysis and interpretation of scientific data and other statistical tools.

4. The Farming System Research Specialist more than fulfilled his TOR, and advanced the FSR approach in Bangladesh through highly active programs in the field, classroom, and laboratory level. A strengthened, on-farm research program has been established in Bangladesh largely because of the efforts of this specialist.

5. The Livestock Specialist left after 21 months of service to the contract, but generated several important base line documents during his tour of duty, the most significant including guidelines for research in livestock, guidelines for animal health and livestock development programs.

6. The Integrated Pest Management Specialist left behind an effective blueprint for the development of a national IPM program, national pesticide safety guidelines, and plans for a national pest diagnostic center and network. The IPM impact on FSR was not as significant as was hoped, but many IPM concepts may prove useful in the future.

7. The Communication Specialist enhanced the development of a highly useful library documentation system, provided valuable guidelines for information preparation, and packaging and transfer of technology methods.

8. The Aquaculture Specialist has done an exceptional job of integrating Fisheries Research Institute, On Farm Research Department technology, and field level Farming systems Research programs with a wide scale aquaculture impact. Perhaps one of the most valuable inputs has been to show the economic potential of less input projects for small pond holders in Bangladesh.

FARMING SYSTEMS APPROACHES

The FSR approach in Bangladesh enjoys a deservedly high global reputation. It is obvious from the evaluation team's visits to many different farm villages that both the staffs involved in, and the farmers affected by, these approaches are extremely pleased. It is a pleasure to evaluate such well-conceived and well-run programs. More importantly, (1) diets are being improved (through more stress on non-traditional crops and livestock components such as fish and poultry, pulses and vegetables), and (2) more calories are going into these households (through yield increases in the traditional rice crop). Overall, the evaluation team gives the FSR approach of Bangladesh very high marks.

The strengths of these approaches greatly outweigh their problems and drawbacks. The ARPII (Supplement) has contributed in an entirely positive way to strengthening these approaches, focusing as it is mandated to on the BARI OFRD.

Some of the more memorable accomplishments of the FSR approaches include:

1. Currently, the FSR approach, in some form, is in 20 FSR sites;

2. Collaboration between different ARIs was observed at the local level between most of the ARIs practicing FSR;

3. The FSR sites have served a good function as interface nodes between farmers and researchers of all other ARIs involved in a FSR approach, and as such, have facilitated the addition of livestock, aquaculture, homestead gardens, and agroforestry components or sub-systems into the farmers' own systems;

4. More than 100 innovative FSR technologies have been developed; 52 have been synthesized; 7 have been accepted as "mature" technologies.

Some of the areas which can be improved upon in the FSR approaches include:

1. BRRI-BARI cooperation at the higher levels of administration, specifically the sharing of either newly-released MVs or of improved components of technology, more quickly;

2. The relationship between research and extension, in regard to the spread of improved technologies or MVs from beyond the FSR site level to the rest of the same AEZ;

3. Mobility to insure conduct of season-specific observations or monitoring in a timely fashion;

4. Young, dynamic staff faces a lack of innovative, acceptable incentives and career advancement possibilities;

HUMAN RESOURCE DEVELOPMENT

The NARS has a fairly large scientific staff, 1337 in number as of 1990, doing research covering all the main sub-sectors of agriculture -- crops, livestock, fisheries and forestry. Over time, there have been improvements in the quality of scientific resources. Scientific resources are heavily concentrated towards improvements of cereal crops in line with the development strategy of the government. As a result, scientific resources turn out to be inadequate in some other fields, e.g., pulses, livestock, etc.

External funds constitute about a quarter of the research budget of the NARS. Research expenditures as a percentage of agricultural GDP have been much less than what is suggested by FAO, the World Bank, etc. This has been a constraint towards increasing operational efficiency of the scientists. Other constraining factors are inadequate supporting staff, less incentive on the part of scientists due to the absence of a satisfactory promotion system and other facilities, and, above all, lack of public appreciation of scientists.

ISNAR has developed a very useful standardized schedule for human resource development study. The survey conducted with the schedule should be made more useful by incorporating some related additional informations.

Regional institutes are in relatively disadvantageous positions with regard to scientific resources -- both human and non-human. Higher-skilled persons are relatively fewer in number in these stations.

Checchi has helped develop NARS human resources by assisting in the realization of the training programs. However, the degree training programs suffered quite substantially due to a number of factors: failure in English efficiency test (ALIGU) on the part of some students admitted for degree courses abroad, absence of a "rotating fund" for disbursement of the taka component of aid, various restrictions and rigidities of various types in the GOB in this regard, etc.

SUMMARY (continued)

ATTACHMENTS

K. ATTACHMENTS (List attachments submitted with this Evaluation Summary; always attach copy of full evaluation report, even if one was submitted earlier)

Evaluation Report

MISSION COMMENTS ON FULL REPORT

L. COMMENTS BY MISSION, AID/W OFFICE AND BORROWER/GRANTEE

The 88 recommendations made by the External Evaluation Team are broad and are not written in a significant way that would permit USAID and BARC to make any major change to the project that is not already in progress. It was, as a draft report, and even now as a final version, not a well done evaluation in the opinion of the OFA, the PRC and many BARC and NARS managers. It seemed paradoxical. The TORs were considered by most USAID/Dhaka staff who were involved to be well-written and pertinent. The TORs were discussed by OFA staff and the Evaluation Officer with BARC and key NARS managers. They were discussed adequately by OFA and the Evaluation Officer in briefing sessions with the consultants when they arrived. The qualifications of the Contractor's team were exceptionally good. However, the report simply doesn't pull all of its findings together, draw conclusions, and present recommendations in a way that facilitates discussion or motivates responsible parties to take action.

OFA, the USAID Evaluation Officer and the contractor's home office professional staff did attempt to edit the report. First, OFA and BARC discussed the report and wrote to the contractor, TRD, an IQC, in December, 1991, asking them to edit and revise their report.

TRD did resubmit a revision of their report in February, 1992. Finally, OFA and BARC discussed all of the recommendations several times in March, 1992 to try to select and organize the most important ones for PRC consideration. The delay in this PRC is the result of the problems of the evaluation report.

The recommendations presented above are thought by the PRC to be most helpful because they either reinforce changes already in progress through other efforts or because they propose changes that should and can be made within the few months remaining in the project.

They are divided, like the report and the Project Paper, into four subject areas: (1) research system management (Chapter 2 of the Report); (2) core discipline development (Chapter 3); (3) farming systems research and technology transfer (Chapters 4 & 5); and (4) human resource development (Chapter 6).

XD-ABE-393-A

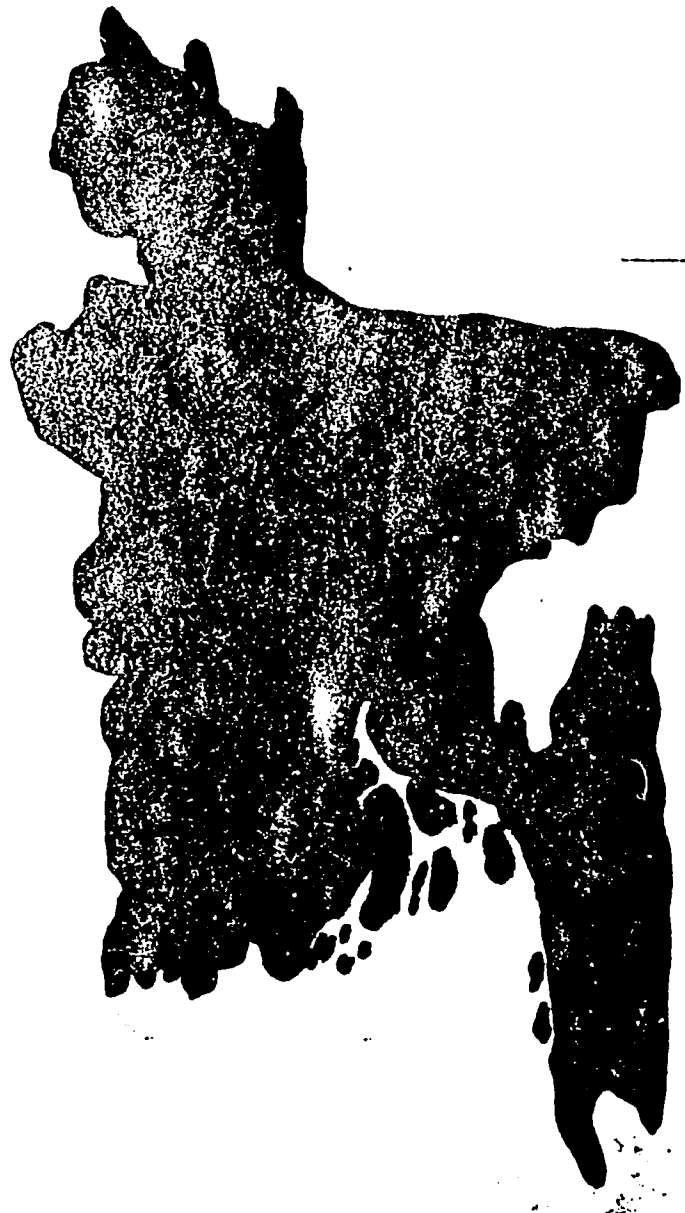
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
PDC-1406-I-00-0073-00
Delivery Order No. 3

PROGRESS EVALUATION

AGRICULTURAL RESEARCH PROJECT
PHASE II-SUPPLEMENT
No. 388-0051

Ammended Version

February, 1992



Tropical Research & Development, Inc.

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ACKNOWLEDGEMENTS

The Project team would like to extend their appreciation and gratitude to the USAID Office of Food and Agriculture, Checchi, ICLARM, ISNAR, IRRI, and AVRDC for their cooperation and assistance in carrying out this evaluation. The Project Team's special thanks go to Mohammed Latifur Rahman for his tremendous efforts in working with the team.

STUDY TEAM

George Marlowe, Ph.D. (Team Leader)
Ashraf Uddin Chowdhury, Ph.D.
Daniel L. Galt, Ph.D.
Carl Pray, Ph.D.
S.A. Wahed, M.S.

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ACRONYMS

ADF	Agricultural Development Fund
AEZ	AgroEcological Zone
AID/W	Agency for International Development in Washington
ARI	Agricultural Research Institutions
ARP-II	Agricultural Research Phase II Project, Number 388-0051
AVRDC	Asian Vegetable Research and Development Center in Taiwan
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BAU	Bangladesh Agricultural University
BBS	Bangladesh Bureau of Statistics
BDG	Bangladesh Government
BCSIR	Bangladesh Council of Scientific and Industrial Research
BINA	Bangladesh Institute of Nuclear Agriculture
BJRI	Bangladesh Jute Research Institute
BRAC	Bangladesh Rural Advancement Committee (NGO)
BRRI	Bangladesh Rice Research Institute
BS	Block Supervisor
BSFIC	Bangladesh Sugarcane and Food Industries Corporation
BTRI	Bangladesh Tea Research Institute
BWDB	Bangladesh Water Development Board
CSO	Chief Scientific Officer
CSR	Cropping System Research
CU	Chittagong University
DAE	Department of Agricultural Extension
DAO	District Agricultural Officer
DG	Director General
DLS	Directorate of Livestock Services
DOF	Directorate of Forestry
DU	Dhaka University
DWRC	Denver Wildlife Research Center
EA	Environmental Assessment
EPAT	Environmental Policy and Training (A.I.D.)
EVC	Executive Vice Chairman (BARC)
FAR	Fixed Amount Reimbursement
FIRI	Fisheries Research Institute
FRI	Forestry Research Institute
FSR	Farming System Research
FYP	Five Year Plan

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GM	Green Manure
GOB	Government of Bangladesh
HRD	Human Resource Development
HVPP	Homestead Vegetable Production Program
HYV	High Yielding Variety
IARC	International Agricultural Research Center
ICLARM	International Center for Living Aquatic Resources Management
IFB	Invitation for Bids
IPC	Institutional Project Coordinator (of FSR activities)
IPM	Integrated Pest Management
IPSUBARC	International Project Support Unit
IRRI	International Rice Research Institute in the Philippines
ISNAR	International Service for National Agricultural Research
JTS	Joint Target Setting
Kg	Kilogram
L/COMM	Letter of Commitment
LDC	Less Developed Country
LOP	Life of Project
LRI	Livestock Research Institute
LV	Local Variety
MHAT	Moist Hot Air Treatment
MLT	Multi-Locational Testing
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MOI	Ministry of Industry
MSc	Master of Science Degree
MPs	Members of Parliament
MT	Metric Ton
MTSP	Multi-location Testing Site Program (OFRD)
MV	Modern Variety
NALDOC	National Agricultural Library and Documentation Center
NARP	National Agricultural Research Plan
NARS	National Agricultural Research System
NCCSRP	National Coordinated CSR Program
NCFSRP	National Coordinated FSR Program
NIFR	National Institute of Fisheries Research
NGO	Non-governmental Organization
NTC	National Training Council
OFRD	On-Farm Research Division (BARI)
OFTD	On-Farm Trials Division (BARI)
PACD	Project Assistance Completion Date

PACMAR	Pacific Management Resources, Inc.
PASA	Participating Agency Service Agreement
PhD	Doctorate of Philosophy
PIL	Project Implementation Letter
PIO/T	Project Implementation Order for Training
PL-480	Titles I, II and II - USG Agricultural Trade Development and Assistance Act of 1954, as amended: i.e., agricultural commodity loans & grants
PP	Project Paper
PPP	Pilot Production Programs
PREAID's	Bureau for Private Enterprise
PSA	Procurement Service Agent
PSO	Principal Scientific Officer
RARS	Regional Agricultural Research Station
RLA	Regional Legal Advisor
RRA	Rapid Rural Appraisal
RU	Rajshahi University
SAARC	South Asian Association for Regional Cooperation
S&T/AGR	AID's Bureau for Science and Technology, the Directorate for Food and Agriculture
SC	Sugarcane Corporation
SDB	Office of Small and Disadvantaged Business Utilization
MO	Subject Matter Officer
SMS	Subject Matter Specialist
SO	Scientific Officer
SOW	Scope of Work
SRM	Senior Research Management
SRTI	Sugarcane Research and Training Institute
SSO	Senior Scientific Officer
STP	Spaced Transplanted
T&V system	Training and Visit System
TAPP	Technical Assistance Planning Paper
TA	Technical Assistance
TOR	Terms of Reference
TTMU	Technology Transfer Monitoring Unit (BARC)
UAO	Upazila Agricultural Officer
USAID	AID Missions Overseas
U.S.	United States of America
USG	United States Government
WIRFs	Women in Rice Farming Systems

EXECUTIVE SUMMARY

This progress evaluation was designed to assess the impact of the Agriculture Research Project Phase II Supplement (ARPII-S) the purpose of which is to strengthen research capabilities in Bangladesh. In addition, the team was charged with generating recommendations for future action by the Project staff and the Mission.

CORE DISCIPLINE IMPACTS

The evaluation team found that the ARPII-S Technical Assistance (TA) team has responded to the majority of the tasks set forth in the terms of reference for their positions. The core discipline impacts of the TA personnel can be summarized as follows:

1. The Chief of Party/Human Resources Development Specialist functioned as an effective administrator and liaison between the Bangladesh Agricultural Research Council (BARC) and the various Research Centers, and interfaced exceptionally well with the enterprise side of small holder farmers and industry support groups.

2. The Research Systems Management Specialist provided valuable support to BARC in the development of a wide variety of research management tools such as planning, prioritizing, evaluating, reporting, and networking instruments. This specialist also strengthened linkages between BARC and the International Service for National Agricultural Research (ISNAR).

3. The Agricultural Economist made several long term impacts in the development of a Social Scientists Network which may help insure the presence of socioeconomic inputs into planning, the introduction of a cost effective, comprehensive manual on Rapid Rural Appraisal in Farming System Research (FSR), and enhanced training in the analysis and interpretation of scientific data and other statistical tools.

4. The FSR Specialist more than fulfilled his Terms of Reference (TORs), and advanced the FSR approach in Bangladesh through highly active programs in the field, classroom, and laboratory level. A strengthened, on-farm research program has been established in Bangladesh largely because of the efforts of this speciaiist.

5. The Livestock Specialist left after 21 months of service to the contract, but generated several important base line documents during his tour of duty. The most significant included guidelines for research in livestock, guidelines for animal health, and livestock development programs.

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RESEARCH SYSTEM MANAGEMENT

During the past 15 years Bangladesh has had its National Agricultural Research Systems (NARS) reviewed seven or more times. Numerous management tools have been developed, many individuals have been trained, and shelves of suggestions for structural and program improvements generated. The recurrent theme of these reports, with which this evaluation team concurs, is that, though the Bangladesh Agricultural Research Council and the NARS are in need of institutional improvements, the value of their roles cannot be underestimated.

The weakest point in the NARS in Bangladesh is typical of developing countries trying to manage limited funds:

- Limited communication between NARS and government decision-makers,
- Poor vertical communication within the institution of NARS so that bureaucratic interests often overshadow research-based needs,
- Poor communication between the institutions of NARS and their client populations - particularly with low-resource farmers,
- Insufficient attention given to developing an integrated approach to research planning,
- Inefficient bureaucratic operation and poor planning,
- Personnel policies that do not encourage innovation and creative action,
- Low pay,
- An under-supported information delivery system.

In short, most of the rate, output, and qualitative limiting factors within the system are beyond the scope of the TA team's and the Mission's control since they relate to policy matters which must be addressed by the Government of Bangladesh (GOB). However, the TA team and the Mission can initiate policy dialogue with counterpart GOB ministries through implementation of some of the recommendations made below and through the use of follow-up evaluations by Organization Development and Public Administration specialists.

Because of the above conditions, the evaluation team's recommendations are primarily policy-related rather than research or technically based, and lie beyond the Project's span of control. However, one major issue can be addressed by the Mission. ARPII-S, as it is currently designed, is too comprehensive to be properly monitored by the limited staff at USAID and BARC. As such, the project has had only fragmentary supervision. Whereas major changes in the project's design do not appear to be feasible at this time, intensification of support for the most effective programs such as aquaculture, farming systems, and research management should be considered. Accented support and closer monitoring of fewer programs could improve morale as well as output.

The remainder of the evaluation team's recommendations detail NARS political, personnel, planning, and methodological shortcomings and the role that ARPII-S and Mission personnel can play in addressing them.

The importance of agricultural research in general, and FSR in particular, is not appreciated by the GOB decision-makers. For example, the NARS budget is well below the standards established by Food and Agricultural Organization (FAO), World Bank, and UN World Food Conference. The TA team and the Mission can help their counterparts illustrate the importance of the NARS to national development goals by tying research plans to national development plans while underlining that investments in agricultural research are cost effective. The TA team has the expertise and resources to promote such activities.

A specific activity which will help underline the NARS contribution to economic development in Bangladesh would be the creation of a well organized catalogue of major constraints to each segment of Bangladesh agriculture. The catalogue will ensure that research efforts target the country's most pressing agricultural problems. BARC and the NARS should compile a meaningful listing of the major constrains to effective production and marketing of each agricultural crop. This catalogue should include a list indicating the relative importance of each constraint which could be used by decision-makers to establish research planning priorities. For example, efforts towards post harvest loss reduction is minimal though the need to reduce losses, particularly for low-resource farmers, is great. Proven post-harvest loss reduction methodologies should be taken

from internationally available "shelf technologies" and injected into extension activities as soon as possible. USAID can provide short-term technical assistance to promote this planning methodology in Bangladesh.

The various institutions within the NARS should change their management style to allow for greater horizontal and vertical communication. The evaluation team cited numerous examples where the opinions, needs, and expertise of researchers and clients were neither sought nor incorporated into decisions and planning documents. As a result, institutional actions and planning documents do not always reflect the most effective means to fulfill each institution's mission.

The TA team already effectively seeks out and incorporates input from a variety of stakeholders. However, some research scientists felt that they did not have adequate involvement in the design of ARPII-S nor in the selection of its technical assistance components and its evaluation performance criteria. Though BARC was involved, most of the research community feels that they are not adequately represented by their discipline directors. The Mission can engender appropriate management styles through insisting upon open communication with, and the involvement of, all stakeholders including BARC and the individual scientists. By using participatory management practices in its interaction with host country professionals, the Mission can provide a model for its counterpart institutions.

The role of FSR methodologies with its attendant integrated (multidisciplinary) perspective on the agriculture sector must be enhanced in Bangladesh. The FSR Specialist's efforts to date have been exemplary and the momentum created towards integrating FSR into NARS must be maintained through continued or increased support by the Mission. The advantages of such research needs to be demonstrated by BARC and cross-institution cooperation engendered.

Whenever appropriate, research efforts should include FSR considerations as well as market-based decision-making criteria. Farmer-ranked priorities should be institutionalized into the annual FSR planning process. The FSR approach to a more risk spreading, market oriented, and appropriate system for Bangladesh has made a great impact, but few of the accomplishments can be assessed for economic impact. The FSR approach should be streamlined to make farmer responsive research more effective and more timely. FSR sites should be designed for definite terms of operation, have assessment markers built into the design, and have responsibilities assigned to personnel who have the interest and training to monitor this type of research. Some of the aquaculture sites have developed reasonably good impact assessments which could serve as models for this type of activity. USAID and the TA team can provide leadership in these areas.

Major policy changes are needed to enhance the development of small equipment, seed, and pesticide businesses. Most of the small agriculture support business persons encountered expressed the severe limitations of start up capital and the availability of "reasonable" credit. These constraints are commonly expressed in developing countries, however, business people in Bangladesh felt that the GOB did not promote a climate of enterprise. The project team, USAID, and the donor community should promote meaningful dialogue with appropriate GOB policy makers to demonstrate the advantage of creating a policy environment conducive to entrepreneurial activity. Project personnel should actively demonstrate to GOB decision-makers how agribusiness can promote economic development through non-farm rural income and employment generation.

The influence of intensive agricultural practices on the environment has been given only minimal consideration. Natural resource management and agricultural production risk management needs to be given greater emphasis. The word "sustainable" is a fairly new concept to NARS in Bangladesh. The need for the incorporation of environmental assessment (EA) criteria into agricultural research planning is urgent. BARC and the NARS should be able to address natural resource and production risk management considerations through greater use of the multi-disciplinary team approach which should include socioeconomic disciplines. The Mission can encourage the incorporation of EA methodologies in the national agricultural planning and decision-making process since it is already a leader in EA-training worldwide, and has expertise from which is can draw in Washington. For example, A.I.D. is currently funding the Environmental Policy and Training (EPAT) project which the Mission can consult for EA-training support.

The NARS institutional practices and personnel policies need to be changed in order to encourage a higher standard of professional performance by research scientists. Most research scientists in the Bangladesh agricultural research system indicate that government personnel policies do not encourage creative output. Pay scales and advancement are based on seniority rather than performance and total accountability. In addition, scientists in Bangladesh have little freedom to earn supplemental funding from outside funding sources.

Governmental responsibility for agricultural crops, livestock, fisheries and forestry are found in four different ministries. Recruiting and promotion are not uniform. Scientists' performance are measured by the same standards as non-scientific personnel and there is little freedom of lateral and/or upward movement of personnel between institutions. In addition, nearly all research personnel, especially those at the regional research stations, indicated that they worked under severe constraints in technical, logistical, and transportation support. It appears that BARC needs to determine how much research effort they can afford to do properly, rather than wish to do.

The solutions to the above series of problems are evident and have been cited in many previous studies concerning NARS, yet such fundamental changes in government policy will require involvement of the highest level decision-makers in the GOB. The Mission can use its influence in this realm through maintaining policy dialogue with counterpart officials in the GOB and through commissioning a comprehensive study of current personnel policies which would recommend policy changes for research personnel. The study should involve the active input of respected researchers and Organizational Development and Public Administration experts.

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter contains a summary of the 88 recommendations generated by the evaluation team and which are found in Chapters 7-11 (pp. 70 and 87). The Findings/Conclusions and attendant Recommendations are those which the team determined were the most pressing and therefore in need of attention.

The recommendations in this summary chapter and in the body of the report are organized to coincide with the report's format. The broad subject area of ARPII-S and its role in promoting agricultural research in Bangladesh is divided into component parts: Research System Management (and Project Management); Core Discipline Development; Farming Systems Research and Technology Transfer Linkages; and Human Resources Development. Thus, if the reader wishes to review the analysis upon which the team's recommendations are based, they can turn to the corresponding chapter in the report (which is indicated parenthetically next to each subject title for the reader's convenience) for further study.

A. Organizational (Chapter 1)

I. USAID:

Finding\Conclusions: The ARPII-S is too comprehensive for BARC and USAID to effectively monitor. USAID has had little management continuity due to a turnover of Project Managers during the past few years. Terms of Reference for TAs varied between early and late versions, with duties often overlapping. BARC felt that USAID demanded too much accountability and made unrealistic demands for data on short notice.

Recommendation: The project should be restructured in its remaining years to focus support on the most effective programs such as aquaculture and FSR agribusiness development. USAID should consult with a broad base of stakeholders including research scientists from the research centers, as well as BARC when selecting which programs to target for increased support.

II. BARC

Finding\Conclusions: Research scientists generally felt that representation at BARC was inadequate; communications between headquarter centers poor; appreciation and awareness of field activities by BARC minimal; and that involvement in creating policies related to scientific effectiveness by the research

staff is grossly lacking. Over-dependence on expatriate assistance by BARC was also frequently cited as a problem by those interviewed.

Recommendations: BARC should address these field centered comments and institute a forum for exchange which would include an appropriate mix of administrators, bench scientists and involved Ministry resource persons. The research community should be involved in decisions involving their work life.

B. **RESEARCH SYSTEM MANAGEMENT** (Chapter 2)

1. Finding\Conclusions: The BARC Executive Vice-President does not have direct access to the Ministry of Agriculture. Manpower policies within NARS are not standardized, nor do they encourage innovative behavior by research scientists. Research reporting needs to be standardized with research planning needs involving a broader base of expertise. Market-oriented decision-making needs to be injected into research planning, greater reward for research productivity needs to be initiated.

Recommendation: A National Policy for Agriculture needs to be developed by the GOB with help from BARC and experienced scientists in the agriculture resource system. This policy should include upgrading of the BARC-EVA, development of a National Manpower Plan, and appreciation of market oriented research programs. An improved National Personnel Policy should be developed that rewards creativity and uniqueness of the research process. Five year review of all institutes should be mandatory to enhance accountability and relevance.

2. Finding\Conclusions: GOB responsibility for crops, livestock, fisheries and forestry are all under different Ministries. Recruiting and promotion are not uniform. Scientists are measured by the same standards as non-scientific personnel. There is little freedom of lateral and or upward movement of personnel within and between NARS institutions.

Recommendations: BARC, the NARS, and the GOB should develop a uniform recruitment and promotion system for those in research based on objective standards. Open competition for all vacant positions should instituted and freedom of movement between Agricultural Research Institutes (ARIs) should be allowed. All agricultural components should be under the Ministry of Agriculture in order to enhance cost effectiveness and efficiency of operation.

3. Finding\Conclusions: Multi-disciplinary planning, implementation, and reporting were found to be minimal in Bangladesh. The Bangladesh Agriculture University

(BAU) has just recently shifted from a discipline-specific curriculum to a more holistic agricultural approach. The terminology and methods of FSR are becoming familiar aspects of planning in some research initiatives in Bangladesh.

Recommendations: The advantages of multi-disciplinary research need to be demonstrated by BARC, and cross institute cooperation enhanced. Whenever appropriate, research efforts should include FSR considerations. In addition, market oriented decision-making concerning research programs should be increased.

4. Finding\Conclusions: A well organized catalogue of major constraints for each segment of Bangladesh agriculture is needed to insure targeted research efforts. Post harvest loss reduction technology is minimal.

Recommendation: BARC and the NARS should compile a meaningful listing of the major constraints to effective production and marketing for each agricultural sector. This catalogue should include a prioritized review of constraints to agricultural production and marketing to assist decision-makers as they establish priorities for research planning. An initial intervention should be in the field of post harvest loss reduction since internationally available "shelf technologies" lend themselves to being injected into extension activities as soon as possible.

5. Finding\Conclusions: Scientists in Bangladesh have little freedom to earn supplemental funding from outside funding sources. BARC has been heavily dependent on expatriate assistance in the development of research management approaches. Sociologists and economists are only occasionally included in agricultural research planning in Bangladesh.

Recommendation: The Socioeconomic Network should be encouraged, strengthened by USAID, and utilized by NARS institutions. Scientists should be encouraged to compete for appropriate research funds from outside sources. BARC should develop more of its own planning and capacity including its own reporting instruments and methods.

C. **CORE DISCIPLINE DEVELOPMENT** (Chapter 3)

1. Finding\Conclusions: The relationship of BARC and the NARS with International Agricultural Research Centers (IARCs) other than those represented on the TA Team (IRRI, ICLARM, ISNAR, AVRDC) is minimal.

Recommendations: A broader approach to gaining access to developed technologies and improved germ plasm from the other 20 or so IARCs throughout the world should be instituted by BARC and appropriate ARIs.

2. Finding\Conclusions: Science and technology policy issues which address research impact, funding, and input policy (seed, etc.) is given only minimal consideration.

Recommendation: The TA Team, USAID, and BARC should enlist the services of a specialized consultant to offer guidance on how the Ministry of Agriculture (MOA) and BARC could develop a platform for a science and technology (S&T) policy approach.

3. Finding\Conclusions: The influence of intensive agricultural practice on the environment has been given only minimal consideration. The word "sustainable" is a fairly new concept in NARS Bangladesh. Biotechnology has become established with modest achievements.

Recommendation: The need for the introduction of environmental assessment decision-making criteria into agricultural research planning is urgent, and BARC and USAID should encourage its role. Recommendations for introducing agricultural practices which mitigate negative environmental impacts on the environment have to incorporate low-resource farmers' constraints. Such recommendations must be low-cost, low-risk, and have a high return on investment to be useful. Biotechnology methods such as embryo rescue, tissue culture, and other fast pay-off techniques should be encouraged.

4. Finding\Conclusions: Patent protection and plant breeder rights do not have a high priority. Private sector research is minimal in Bangladesh. International development agencies have not encouraged private sector research.

Recommendations: USAID and other international agencies should assist in the development of research grants in which its private sector could compete. BARC, MOA and GOB should help develop meaningful plant breeder rights so that the private sector can be assured that they will derive economic benefit their much-needed output.

5. Finding\Conclusions: Natural resource management and agriculture production risk management is not widely practiced in the agricultural sector.

Recommendations: BARC and the NARS should be able to address national resource and production risk management concepts through the greater use of the multi-disciplinary team approach (which should include the socioeconomic disciplines).

D. **FARMING SYSTEM RESEARCH AND TECHNOLOGY TRANSFER** (Chapters 4 & 5)

1. Finding\Conclusions: FSR in Bangladesh is widespread. FSR programs are loosely coordinated and lack a national plan.

Recommendations: BARC and ARPII-S should host an annual Bangladesh workshop of FSR practitioners to report results, discuss work plans, and agree on national approach. Proceeds from the workshop should be published and distributed annually.

2. Finding\Conclusions: Exchange of germ plasm, methods of timing, methods of reporting and involvement of extension staff in FSR sites lacks a countrywide coordinating mechanism.

Recommendations: BARC, ARPII-S and NARS should provide greater assistance in the development of an improved coordination and exchange system for these inputs.

3. Finding\Conclusions: The FSR sector has not effectively developed a uniform set of impact assessment criteria.

Recommendations: ARPII-S, BARC and NARS FSR Specialists, in cooperation with the Socioeconomic Network, should develop flexible, but fairly uniform templates for appropriate measurement of impact. The criteria should include an assessment of economic value, spread effect, acceptance, and resistance features related to the new technologies. The group should also develop an FSR publication dedicated to the dissemination of basic assessment procedures and criteria and report findings.

4. Finding\Conclusions: A great number of FSR-filtered technologies have been developed but are not readily accessible to a wide audience since they exist in scattered paper notes or workshop hand outs.

Recommendations: As much as possible ARPII-S should assist the NARS associated with FSR to compile all available filtered or advanced FSR technologies

into the Farm Action Software Program, after which access training should be provided to FSR workers.

5. Finding\Conclusions: Training for FSR workers in the BAU and Non-Governmental Organizations (NGO) falls short of the unique needs of both groups, should be separate and intensified.

Recommendations: A training course tailored to each specific group involved in FSR is needed to meet their unique background. All training programs should use hands-on training in planning, implementing, collecting data, synthesizing and reporting FSR outputs.

6. Finding\Conclusions: FSR response to natural disaster recovery lacks thorough planning and preparation.

Recommendations: BARC, ARPII-S, NARS and Agriculture Extension needs to develop a national plan for recovery of farm operations after natural disasters. Seed, small equipment, and other inputs need to be transferred from non-damaged to damaged areas as quickly as possible, along with the reconstruction of dwellings, etc.

7. Finding\Conclusions: Farmer ranked problems do not appear to be given adequate consideration in FSR planning.

Recommendations: The articulation and aggregation of farmers' priorities should be institutionalized into the annual FSR planning process. The FSR approach should be streamlined to make farmer- responsive research more effective and timely.

8. Finding\Conclusions: Few of the mature FSR technologies have been prepared in publications appropriate for direct farmer use.

Recommendations: The NARS, AIS-BARC and the MOA should prepare as many of the mature technology packages for its farmer audience as quickly as possible.

9. Finding\Conclusions: Policy makers do not have adequate awareness of the value of FSR (and often research in general is only casually understood) to national development.

Recommendations: BARC and the NARS need to develop effective public information publications to help explain the value of FSR (and Agriculture

Research) to Bangladesh development. A follow-on to this approach would be to amplify mass media efforts for the general public.

10. Finding\Conclusions: Pest management problems in the FSR program are not given adequate attention by the NARS plan protection wing.

Recommendation: FSR-related pest management problems need serious attention by the NARS plant pathologists and entomologists. Preventative and management programs need to be relayed to FSR workers, and IPM methodology where appropriate, should be initiated after training FSR workers in that system.

11. Finding\Conclusions: While many of the FSR sites are used as NARS fine-tuning sites for office station research, many have become semi-permanent.

Recommendation: NARS and FSR should continually assess the need for continuing an FSR for more than three to five seasons. If basic information has been demonstrated, spread effect measured, and economic impact assessed for the site, new sites should be explored.

12. Finding\Conclusions: In general, FSR workers felt under-compensated for their long days in the field as compared to station-centered personnel.

Recommendations: BARC should develop a revised set of job performance criteria for rewarding effective FSR workers.

E. HUMAN RESOURCE DEVELOPMENT (Chapter 6)

1. Finding\Conclusions: Many of the training programs provided by ARPII-S did not provide sufficient hands-on training to allow for intended technology transfer. For example, in some of the computer training programs, many trainees were reluctant to admit that they had not learned the techniques.

Recommendations: ARPII-S may need to develop feedback loops in their training program to ensure that training objectives have been met. Regular skills-based reviews of trainee performance can be incorporated into regular sessions to minimize trainee perceptions that reviews are for punitive purposes.

2. Finding\Conclusions: English language training for higher degree trainees is markedly inadequate.

Recommendations: BARC should establish English language courses (or monitor the progress of such courses taken by candidates elsewhere) to help students prepare for training abroad.

3. Finding\Conclusions: Selection for degree training does not seem to be based on objective decisions.

Recommendations: Candidates should be selected on prioritized needs as determined by the National Manpower Needs Plan.

4. Finding\Conclusions: Nearly all research personnel, but especially those at the regional research stations, indicated severe shortages in technical, logistical, and transportation support.

Recommendations: BARC decision-makers should determine how much research effort it can afford to do properly, and should base their decision upon the National Agricultural Development plan and constraints as mentioned in Research System Management recommendation four.

5. Finding\Conclusions: The BARC - ISNAR human resources study lacks several important segments of information.

Recommendations: The HRS should be strengthened by adding the number of sanctioned posts available for office positions by research instituted, length of GOB service, academic degrees, and positions held.

6. Finding\Conclusions: Foreign training and travel is restricted by the GOB even when its funds are not involved.

Recommendations: BARC and the NARS should campaign for a case by case approach to training and travel grants that are externally funded.

7. Finding\Conclusions: The planning process of the Planning Commission seldom involves agriculture scientists in the development of the National Five Year Plans.

Recommendations: NARS scientists should be involved in the development of the National Plan. Their involvement should be properly planned so that their input is submitted to decision-makers well ahead of deadlines. Selection for participation in the planning process should include participant appreciation of multi-disciplinary analyses and professional experience.

8. Finding\Conclusions: A great many of the scientists at the field level lacked adequate training to do their job effectively.

Recommendations: BARC and NARS must carefully prioritize research programs and assign research tasks to the best qualified personnel available.

9. Finding\Conclusions: The NARS research budget is far below standards established by the FAO, World Bank and the UN World Food Conference.

Recommendations: The NARS budget should be progressively increased by the GOB, which can only be done by extremely careful analysis of national priorities and the resource base.

10. Finding\Conclusions: The BAU curriculum recently restructured to encompass the more holistic needs of Bangladesh agriculture lacks adequate problem-solving skills training.

Recommendations: BAU provides the basic education for most of the NARS scientists and should therefore initiate more market-oriented and problem solving skills training in its revised curriculum.

1.0 OVERVIEW

1.1 Impact of Past Agricultural Research

Past agricultural research has had a major impact on food production in Bangladesh enhancing the achievement of foodgrain self-sufficiency and reducing dependency on imports of oilseeds and potatoes. Social science research has led to better policies to encourage food grain production and manage resources for sustainable agricultural development. The recent history of agriculture in Bangladesh is covered in detail in Appendix E.

The most productive research program in Bangladesh is undoubtedly the rice research program. Figure 1 shows that rice yields per acre have grown steadily since 1980. Part of the increase in yields has been the steady stream of modern varieties (MV) which are responsive to the fertilizer and irrigation which has grown rapidly in the last few years. Part of the increase has also been due to the development of varieties for more difficult conditions, i.e., flood tolerance and late planting in the season. Wheat MVs also contributed to foodgrain growth from 1970 to 1984. The major beneficiaries of this success were small farmers whose income was increased, agricultural laborers who have more employment, and poor consumers who spend most of their income on foodgrain (Hossain et al., 1990).

In addition, there have been some dramatic successes in unexpected places. For example, the Sugarcane Research and Training Institute (SRTI) has developed and spread agronomic and cropping system techniques which have more than doubled farmers' yields of sugarcane on 30,000 acres of land (see Appendix D). The Fisheries Research Institute (FRI) which was established in 1984 has already adapted Southeast Asian technologies to Bangladesh conditions. This technology, Thai sharputi in seasonal ponds, is being used this year in 3,500 small ponds controlled primarily by landless farmers.

1.2. Major Structural Problems

These issues are not original to this evaluation, and have been discussed in many previous reports. Several of the earlier reports were written before the ARP II(s) project was started (for example, Moseman et al., 1980). The most useful recent overviews of these issues are the ISNAR (1990) report and the Review of the ISNAR Report (Eusufzai et al., 1991). The goal, as stated in the Review, is a research system that will "give freedom to creative research" while making such "programs and their personnel accountable for their performance" (Eusufzai et al., 1991, p. 54).

The promotion and recruitment system of the NARS does not reward scientists who are active and innovative, however, there are no penalties for inaction. Report after report has made this point. The Review of the ISNAR Report captures the view of this team:

> Personnel policies should be such as to encourage the creativity and innovative abilities of the research staff of the NARS. An essential precondition for this is that merit and proven performance must provide the bases of promotion and recognition, rather than simply considerations of seniority. (Eusufzai et al., 1991, p. 44)

The team found cases of creative, hard working scientists being passed over for promotion, or denied foreign training because they were doing more research than their superiors and colleagues. In such circumstances the best scholars leave the NARS for Universities, local consulting opportunities, or move abroad. Until this system is changed, there is little hope that better planning, priority setting, and management will greatly improve the research system.

Users of technology are not putting pressure on the research system for results. As a consequence, scientists can conduct the research they think is useful and ignore the wishes of farmers without suffering any financial or status consequences to themselves or their institute if they do not produce useful results. The inability of farmers to influence the system is in part due to the absence of democracy and the development of powerful farmer organizations, and to the research system's dependence on foreign aid, which can be arbitrary and capricious. In the absence of pressure from users for useful technology, there is little pressure for effective planning and efficient technology generation or transfer. The recent change to a democratic government offers Bangladesh opportunities for the research system to establish links with farmers through their elected representatives.

The structure of the NARS is not conducive to effective research. The entire structure is set up for top down planning, priority setting, and management. BARC wishes to encourage the Institutes to do what BARC deems appropriate, although it does not actually have the power to do so. The major research institutes do most of their research at their main station and direct their Regional Agricultural Research Stations (RARS) as to what their program will be. Departmental directors tell their staffs what to do. The entire structure is set up to discourage, rather than encourage, initiative and new ideas from the best trained new scientists and the scientists that have the closest links with the farmer. The relationship between research institutes and the linkage between the institutes and their respective Ministries are not conducive to the sharing of ideas, joint research or the transfer of technology.

Institutional reform is necessary. Recent reports by ISNAR and the Ministry of Agriculture both agree the BARC must be reorganized. Continual struggles between the Ministry of Livestock and BLRI have sapped its energy and reduced its effectiveness. The struggle between the Ministry of Agriculture and the Bangladesh Sugar and Food Industries Corporation over control of the Sugar Research Institute have left it temporarily without research funds.

There does not seem to be a vision in Bangladesh of the role science and technology can play in leading to development. The bureaucracy and donors still seem to view science and technology as a consumer good rather than as a major engine of growth. The evaluation team heard people asking whether Bangladesh could afford so many agricultural scientists, despite evidence of very high returns to investment in agricultural research. Many people are more concerned about "protecting" Bangladesh from foreign technology rather than being concerned about the suffering caused by laws that unnecessarily hinder the import of technology and protect local monopoly interests.

The consequence of the low status of Science and Technology is that there is no Ministry of Science, and no Secretary of for Research at the Ministry of Agriculture. Another consequence is the lack of understanding of the needs of scientists for freedom to think, the need for rewards and punishment on the basis of the new knowledge of technology developed, the need to communicate through "expensive" academic journals, trips to foreign meetings for joint research, the importance of foreign training, and the exchange of new and innovative ideas.

1.3 A Flawed Design

The major flaw in the design of ARPII-S was that it only attacked the symptoms of these problems such as poor management, lack of planning, and a lack of interest in farmers' problems instead of their root causes such as excessive bureaucratic institutional structure, inadequate incentives for research, the absence of pressure from users, and the lack of appreciation for the power of science and technology. Management, planning, priority-setting, FSR, and decentralization will lead to major changes in the research system only if they are accompanied by major structural changes.

1.4 Problems of Assessment

A major difficulty in this evaluation was separating the impact of ARPII-(S) from the World Bank ARP II and USAID's PL480 program. The former strengthened many of the same institutions as did ARPII-(S), while the latter complemented much of the project's field-level research and extension activities.

2.0 RESEARCH SYSTEM MANAGEMENT

2.1 Planning

The Bangladesh Agricultural Research Council (BARC), established in 1973, was mandated to coordinate the national agricultural system. Primary functions included planning, identifying, prioritizing, integrating, monitoring, evaluating and reporting national agricultural research programs.

This very important, but somewhat awesome task, spans four government ministries and ten agricultural research institutes each with their own ordinance and funding linkage to their appropriate ministry. Lacking full fiscal and program control over this wide span of responsibility, the BARC must operate as a "kind uncle" who may be turned to for wise counsel, a good book and encouragement.

The BARC, now almost 20 years old, is far from perfect, but it is working. The Institutes want and expect coordination from BARC, yet each wants a measure of independence in program, fiscal, and personnel decision making. This situation requires BARC to lead by persuasion, provision of ancillary support, and as a major interface with outside technology and resources which may be shared with the individual research centers.

The evaluation team made in depth visits to the individual research centers to meet the scientists who generated the creative output and the leaders who supervised the process, and to experience the physical setting in which these problem solving activities operate. Discussions with the clientele of these Institutes were held whenever possible during visits to plots on farms, farmer meetings, and sessions at farming system sites.

In general, Bangladesh should be proud of its many devoted and well trained scientists who have great concern for the subsistence of small holding commercial farmers. Perhaps one of the greatest benefits of the FSR program has been the involvement of the institutional researcher in the real life problems of the farm. Problem centered research with strong clientele accountability provides real energy to the creative agricultural research process.

During the past decade several significant publications were developed to help guide BARC in its tremendous task of coordination and leadership. Of paramount importance were the four Five Year Plans 1973 to 1978, 1980 to 1985, 1985 to 1990, 1990 to 1995 and the Two Year Interim Plan 1978-80. To assess the slow, but positive improvement in BARC's leadership role, a brief focus on these national plans helps to provide a road map of the destination and pin point some new avenues of approach.

The First Five Year Plan (1973-78) was primarily concerned with control of population growth, attainment of self sufficiency in food grain production, and the development of institutional infrastructure.

The Two Year Interim Plan (1978-1980) focused on national assessment of development priorities in order to better plan activities in relation to available resources. In 1979 BARC presented its First National Agricultural Plan.

The Second Five Year Plan (1980-1985), highlighted agricultural development and reduction of poverty. Increased agricultural inputs and intensification called for doubling of land under irrigation, greater use of fertilizer with high yielding varieties, and improvement of the marketing infrastructure. During this period BARC established five nationally coordinated research programs (farming systems, pulses, soybeans, soil and water management, and socio-economics).

The Third Five Year Plan (1985-90) expressed the Government's desire to improve food self sufficiency and improve the nutritional and basic needs of the rural population. Government policy changes helped to privatize fertilizer distribution, reduce subsidies on several agricultural inputs, and to encourage a more effective use of available resources. Emphasis was given to crop intensification through expanded irrigation, multiple cropping, and crop diversification.

The Forth and current Five Year Plan (1990-95) encourages the development of appropriate technologies capable of ensuring sustainable agricultural growth, improves the nutritional status of the population, safeguards the resource base, and increase and generates employment.

Crop diversification and injection of farming systems research helped to reorient much of the agricultural research in Bangladesh. These changes challenged BARC's role of guiding the research centers into more effective planning and priority setting, information generation and delivery, and greater interdisciplinary research efforts.

The holistic approach to agricultural development (Farming System Research) revealed a serious shortfall in several areas of Bangladesh research, extension, and teaching. The young college graduate in extension who was trained basically as a "crops only" student has not been very helpful to farmers who have chickens roosting over a fish pond, with fruit trees, vegetables, rice, and agroforestry crops growing on the same farm.

The research community was called upon to show how proven elements of technology could be put together into a meaningful small farm program which could be cost effective, create less stress on the environment, and help small farmers improve their economic

position.

To meet these challenges in which more detailed planning, based on carefully selected priorities, could be developed within some economic limitations, BARC and its technical corps of advisors generated meaningful guidelines.

a. Agricultural Research in the Fourth Five Year Plan (FYP) is a very serious and significant publication which provides a clear and concise vision of what the NARS and BARC need to do to speed up the rate of agricultural development in Bangladesh. Inputs from the entire technical assistance team were presented to the BARC Secretariat for their consideration and use.

   The publications generated by the BARC committee system (aided by expatriate technical specialists) go through several stages of development before they are finally presented and released. Their "influence" is felt and permeates throughout segments of the system long before their official birth. Thus, release dates as shown in the bibliography (Appendix F) do not necessarily fall into the most logical sequence.

b. The Guidelines for the Preparation of Research Institute Master Plans within the NARS was initiated and felt soon after the 4th FYP for Agriculture was prepared. The ISNAR senior research management (SRM) specialist worked closely with the BARC specialists on their important publication. If used effectively, these guidelines should help to standardize the strategic planning process and its affiliated documentation.

c. The Management Information System (MIS) was born out of a need to track personnel, research activities, and expenditure in a more rapid manner. This has promise of a very valuable management tool and should provide BARC and all Research Centers with electronic linkage for more rapid decision making. The resident ISNAR SRM Specialist and the short term consultants from ISNAR headquarters provided valuable inputs to the BARC Planning and Evaluation Division in this effort. This system is almost complete, as input from just a few more research institutes is needed. Several training meetings have been held and it is realized that adoption may require extensive hands on training.

d. A comprehensive review of the NARS was conducted in 1990 at the request of the Ministry of Agriculture. The study was conducted by two research officers of the ISNAR with much of the local backstopping done by the Dhaka ISNAR SRM specialist and his staff. The findings in this report indicated that many structural as well as policy changes, were needed in the NARS and BARC if BARC's role of

service is to be enhanced (ISNAR, Draft (forthcoming)). Some of the major changes suggested dealt with the size and composition of the BARC Secretariat; the need for a highly qualified Technical Advisory Committee, greater consensus by NARS staff in planning and priority setting, elevation of the BARC Executive Vice Chairman (EVC) to a post of greater access to the Minister of Agriculture and some 20 more changes. The report is very thorough and contains many valid corrective measures. Official responses to the report are forthcoming although several unofficial committee consideration reports have been generated (ISNAR, Draft (forthcoming)).

The big question which remains to be answered is, if agreement between the Bangladesh Government Ministries, the BARC, the NARS and the donors (USAID, the World Bank, etc.) can be reached, will there be the courage to actually change some of the serious practices or policies that need to be revised ?

e. Another highly significant document generated during the ARPII-(S) period was the Report of the High Level Expert Committee on Agricultural Education (University Grants Commission, Dhaka, Nov. 1990) which set forth sweeping changes in the curriculum at the Bangladesh Agricultural University (BAU) in Mymensingh. The re-direction of the narrow track baccalaureate program in agriculture, animal husbandry, forestry, and fisheries to a more diverse curriculum will help to prepare future extension, research, and agribusiness workers for the more diverse role of modern agriculture (Appendix E).

f. A Manual for Research Program Formulation and Preparation of Research Projects/Experiments was prepared by BARC in 1990 with the able assistance of the ISNAR SRMS. This publication has a great deal of promise to help standardize the formulation, planning, and reporting of research. Many of the scientists were not aware of this excellent publication, but nearly all of the administrative levels were suggesting the need for greater involvement by the scientific staff should be encouraged.

g. The BARC conducted an Internal Review of the Agricultural Research Project II Supplement on their own in 1991. The report generated by the Planning and Evaluation Division of BARC (with able assistance of four Bangladeshi and two Checchi Specialists) illustrated the deep concern for consensus involvement in the planning process.

2.1.1 Priority Setting

a. An Analysis of Agricultural Research Priorities in Bangladesh was released in draft form in June of 1990. This well meaning, thorough, and comprehensive document was prepared by an ISNAR research specialist and a BARC agricultural economist. The adoption of this approach still faces problems of internal acceptance, according to many of the scientists in NARS who have been exposed to the procedure.

What is needed for local and regional prioritization is a simple multifactor priority grid which is developed from inputs generated by researchers, extension workers, and agribusiness workers whenever feasible. If the NARS wishes to foster client and problem driven research programs, their involvement in setting priorities must be considered (Appendix E).

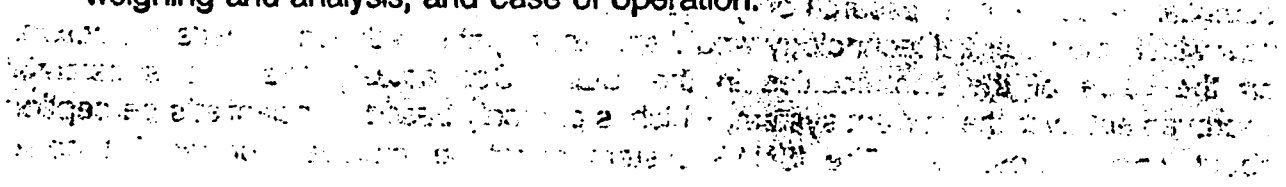
b. Bangladesh Forest Research Institute, Planning and Evaluation in Participating Research, 1991, BFRI, Chittagong.

Several of the research institutes have developed functional systems for reporting and review of their research. The Forestry Research Institute for example, has developed the following headings for its report which provide a rapid scan of results for each of its quarterly review periods:

Project Number and Title	Objectives	Beneficiaries
Starting Year	Progress	Expected date of completion
Cost	Achievements	Personnel Involved

The FRI example is just one of many client driven research programs based on clear priorities, high staff involvement, and thorough periodic review. Such a form should be incorporated into the routine monitoring and evaluation of contract research proposals approved through a system such as the Agricultural Development Fund (ADF) (Appendix E).

c. A rather straight forward priority ranking system was presented in the BARC Guidelines for Preparation of Research Master Plans, April 1991. This methodology provides a basis for involvement, conversion of assigned priorities to numerical weighing and analysis, and ease of operation.



In the BARC Manual for Research Program Formulation and Preparation of Research Projects and Experiments, a more traditional model of reporting is presented, as follows:

Title
Significance & justification of research
Review of pertinent literature
Specific objectives of the study
Methodology to be used
Personnel involvement
Facilities to be used
Expected duration of research
Detailed plan of work
Estimated annual budget
Reports to be generated

A standardized format of reporting needs to be thoroughly discussed by the scientific staff as scientists are the ones who must live with the decision. Standardization promotes retrieval consideration of all key input-output relationships and also sets the stage for better monitoring and evaluation.

In an emergency situation, standard reporting also helps to mobilize expertise depending on the database used. Another benefit of clear research objectives in reporting (as well as planning) is to test goodness of fit of each project and experiment to the long range objectives of a strategic plan.

Comments by the scientists indicate a strong desire to have inputs into these planning and reporting procedures. The most consistent sources of dissatisfaction in the NARS scientific community had to do with promotion and salary, lack of involvement in matters that concern them, and paper flow and decision bottlenecks.

2.2 Priority Setting

The priority setting exercise (described in Norton and Dey, 1990) is the first attempt in the Bangladesh NARS to integrate information from scientists and from economists into the process of establishing research priorities for different commodities. In the past, the only economic information that has been referred to is the value of commodities. Pray (1979) and Gill (1982) compared major commodities' share of total value of commodities with their share of research. Even the value of commodities information was never used in the actual priority setting process by the NARS.

The advantage of the ISNAR method is that it incorporates scientist's perceptions of the potential impact of their research on yields and cost of production and their estimates of how widely the potential technology would spread, together with economist's projections on the value of the commodities in the future. Conceptually this is a substantial improvement over the current system, which is primarily based on scientist's perception about what is possible. The ISNAR system might be improved further if it could

incorporate an objective measure of researchers' or institutes' past success into the probability that they would be successful in the future.

The Norton and Dey paper was intended to be the first step in a priority setting process report. In part because some scientists did not like the preliminary results, the report's authors have not been able to continue the process and the entire methodology is accused of inadequacy. This is unfortunate, as the methodology offers a better way to have biological and social scientists interact on priority setting than anything in use at present.

Research planning does not appear to have advanced much during ARP II(S). BARC was able to write the research component of the Third Five Year Plan with limited foreign assistance. However, the research portion for the Fourth Five Year Plan was largely written by foreign consultants.

Monitoring and evaluation of contract research funded by the World Bank and PL480 appears to have improved during ARP II(S). BARC was not able to manage the World Bank financed contract research program, therefore, the EVC, with the encouragement of the World Bank, stopped most of the contract research and distributed the money directly to the institutes. BARC seems to have done better with the PL480 research money. The BARC planning and evaluation staff assist scientists in writing proposals, reducing the time it takes to get projects approved and funds disbursed. BARC has a system for evaluating and publicizing results of contract research (BARC 1991).

2.3 Research Monitoring

The logical framework is a monitoring and evaluating tool as well as a planning instrument. As presented in the BARC Manual for Research Program Formulation, the ISNAR working Paper No. 12, [The Logical Framework in Research Planning and Evaluation by D. McLean, June 1988] shows how the tool can be used with broad program level activities as well as for individual projects or groups of experiments. When the planners establish the verifiable indications in this matrix, format targets for evaluation are generated.

The logframe format could be modified to suit NARS planning and evaluation needs. Once again, BARC should be warned that involvement will foster adoption, but isolation will probably only generate another shelf document.

Various forms of projects and personnel evaluations are carried out at the various research institutes, but if a NARS wide monitoring system is desired, much work needs to be done. Some of the smaller centers have six month reviews by the top administrator

and three months reviews by the Division or Department head.

The joint target setting (JTS) method may have appeal to the NARS of Bangladesh. It is simple, easy to administer, and self accountable. The researcher and the evaluator outline the targets the researcher thinks he can accomplish in a six month period. At the six month point, they sit together to see how many targets were reached. If a researcher deliberately sets goals too low, peer review would flag such action. The real value of the JTS method is that the researcher feels his administrator is interested in the individual as well as the program.

A comprehensive inventory of the entire NARS equipment on-hand was completed in 1991. This large study was led by a consultant of the Checchi team and a staff of Bangladeshi technicians. The physical inventory tested 13,046 pieces of equipment, presented a ratings of the condition of each item and manufacturer, and indicated the research facility location. This three volume hard copy is also available on DataBase III data files and should help administrators track equipment use and assess repair and replacement needs. In a NARS wide context, such information could promote the sharing of equipment between research centers on a convenience basis. The inventory has the potential for providing a management tool.

The significant and highly adopted report entitled Research Planning Concepts, Principles, Processes, Approaches and Strategies, by the FSR specialist, Checchi team, was released in 1990. An earlier publication by BARC provided Guidelines Farming Systems Research Methodology in a more academic presentation suitable for institutional training (Rahman et al., , 1989). This document has led the way to better planned, better implemented, and more rapidly evaluated FSR field work from the "bottom up" decision process. This publication has been in high use as a training vehicle and field guide.

The recent BARC report on the Human Resources Study of the NARS was released in 1991. This study was planned by the ISNAR SRMS and was led by a senior Bangladeshi agricultural scientist and a staff from a local contracting firm. This comprehensive compilation provides a systematic listing of all professional level staff by title, position, research project involvement, location of training and length of service and specialization. This data base allows for rapid computer retrieval of a wide range of personnel information. For example, if BARC (or a research institute) needed to know the total manpower devoted to rice physiology in the entire country, a simple scan could provide this information in a minute or less. As a management tool, the "Manpower Study" as it is referred to (however, it also includes women scientists) could be used to detect overstrength, shortfall, and relative output levels if used in conjunction with standardized reporting and evaluation forms. This study should be a useful tool for the BARC and NARS in the future.

As the evaluation team visited the various research and education centers of Bangladesh, a fairly rapid scan of research emphasis was made using the modified Program Planning and Budgeting system based on the Agricultural Functions Analysis Matrix. In essence, it has been found that nearly all agricultural activities can be categorized under seven operational elements. Many of the U.S. land grant colleges still use these categories for classification, although the old PPBS system passed away due to its overkill of details and planning. The seven functions can be used for crops, animals, courses, agribusiness activities, or whatever else relates to modern agriculture. The scan of research activities of the NARS research institutes visited appears in Appendix E, but in brief, the categories are explained as follows:

a. Improvement Function. Germ plasm assembly, hybridization, characterization, preservation, mutation induction, bioengineering of genes, evaluation, description and release of germ plasm of breeds/cultivars.

b. Production Function. All of the practices and technology related to the actual growing of the fish, crop, tree or cow, such as the preparation for production, nutrient and water management, cultural practices, growth and development relationships from initiation until the commodity is ready to enter the marketing sequence.

c. Protection Function. All of the pest management practices and technology utilized to protect the crop or livestock commodity from environmental stress, diseases, insects, nematodes and other parasites, and weeds. Often, a sub category of pest biology is included.

d. Harvesting and Handling Function. Aspects of maturity, yield component, recovery methodology, handling operations, market preparation, grades and standards, transportation and storage quality maintenance, scheduling, loss reduction, etc.

e. Marketing and Economics Function. Costs of production and marketing, enterprise feasibility and profitability, supply and demand relationships, market operations and information, etc.

f. Utilization and Processing Function. How the commodity is used, transformed, preserved; how by-products are utilized, etc.

g. Human Nutrition Function. The role of the commodity in the human food chain, its composition, consumption and value.

The scan indicates specific strengths and weaknesses in the various Research Institutes' current programs which may be useful in future planning if more comprehensive coverage is desired by the BARC and NARS.

2.4 Research Evaluation

The BARC and NARS have developed some excellent planning and evaluation administrative instruments. There were a few instances where adoption of these tools was in progress, but in general, it is to early to see wide acceptance. In many cases, knowledge of these new approaches was known only to the top administrative corps. This indicates a need for greater involvement of research workers if adoption is to be integrated in a sustainable fashion.

The NARS units have evaluation procedures for projects, as well as personnel, which have been devised over time, some of which work well. However, evaluation depends heavily on the administrator scientist interaction, thus greater objectivity is needed. Many scientists feel that their performance in personnel evaluations is assessed in a subjective manner, and that personal advancement is determined elsewhere. This feeling is more general than was anticipated by the evaluation team, with salary and promotion issues demanding priority consideration.

2.5 Information Services

An excellent start on the Library/Documentation Computerization Program has been made. This effort is part of the network building concept entitled the National Agricultural Information Network. This network concept is a well designed plan to link resources together making it easier for researchers to review pertinent literature and retain current information in his or her field.

The program depends upon computer availability at each Research Institute, the presence of trained Library/Documentation staff at each center and at the headquarters, funds for purchasing and maintaining current professional journals and books, appropriately dedicated computer linkages, and a commitment by the administrative cadre to support and encourage the program. The library is one of the most important factors in effective research, yet it is seldom given the support it deserves.

Several interesting vehicles have been developed to relay research findings in a less formal way, such as the BARC Agroresearch Newsletter and the Farming Systems/Agribusiness Newsletter. The audience for these publications is a broad-based clientele. However, the BARC newsletter has suffered several lapses in sequence and needs encouragement for timely release. The Communication Specialist of the Checchi

team has been an effective leader in helping to keep technology transfer moving. It is now up to ARPII-(S) to reinforce this newsletter production capability and fully transfer it to the appropriate BARC unit. The Technology Transfer and Monitoring Unit (TTMU) is packaging the mature technologies in forms which can be most readily understood by Extension Block Supervisors and farmers.

Much effort has been extended to train information specialists over the past three years. Equipment has been purchased to make better communication possible, and a network for locating and distributing appropriate research and findings has been initiated. However, until the administrative commitment matches the NARS needs, most of the effort will be less productive than desired.

3.0 CORE DISCIPLINE DEVELOPMENT

The Scope of Work (SOW) asks for "actual research results" and "outputs of core research in developing improved crop varieties and crop production practices." Before examining these points, it is necessary to digress briefly about the nature of research. First, investments in research can take a long time before affecting farmers. Second, research is somewhat like drilling for oil in that there will be many dry holes and a few gushers. Third, despite these two characteristics, the rates of return to public research are high, far higher than investments in large scale public irrigation projects, for example.

Traditional research[1] conducted at NARS during 1988 to the present, the period of implementation of ARPII(S), has had insufficient time to produce direct impacts on farmers. It is virtually impossible for any traditional research project which started in 1988 to have had an impact on farmers. Research takes time. There is a period of time between when research money is received by an institute and an experiment starts. Experiments take a number of years on station to produce scientifically verifiable results. These results have to be confirmed with several years of trials on farmers' fields. There is a diffusion lag from the time when the research results are confirmed and the time it takes to reach farmers. This is caused by the time required to train extension officers and the time required to communicate new knowledge to farmers. Finally, most farmers do not fully adopt any new technology immediately. A farmer must be convinced that the technology is sufficiently superior to his current practices to be worth trying, at which time most farmers will test the technology on a part of their field before they risk using it on the entire farm.

On the other hand, technologies developed before the ARPII-(S) have been extended to farmers during this project, largely through the network of FSR sites and FSR scientific staff employed by the ARIs. While the details of these successes are provided in a later section of the report (Appendix C), key examples are (1) the STP (spaced transplanted) paired row sugarcane technology, (2) the HVPP (Homestead Vegetable Production Program), and (3) the polyculture carp ponds and tilapia ponds and ditches.

Rice breeding requires about ten years between the first expenditure of money and the production of a finished technology. The first year the breeder selects the lines he wishes to cross and hybridizes the crops. He then grows the lines that are produced by that crop for five to six generations until the inbred lines have become genetically stable. He

[1] The evaluation team defines traditional research as that conducted by disciplinary scientists on central, regional, or local sub-stations. This would include, for example, station-based fertilizer and pest control trials and plant breeding.

tests these lines for useful characteristics during the segregating generations, selects those which suit the needs of the country, and then places them in the multi-location testing program for several years. The breeder recommends successful varieties to the National Seed Board for approval (which can take a year or more). If it is approved, the research institute provides breeder seed to BADC which multiplies that for several years and then begins to sell commercial seed to farmers (for production of foundation and certified seed). The result is a 14 or 15 year lag between the time when money was allocated for research and the time when seed of the new variety is widely available to farmers.

If scientists can import varieties or technologies and screen them for useful and harmful characteristics for two years in farming systems sites, instead of always having to develop them from scratch, the time between research expenditure and farmer's field can be cut by more than half. Even in the case of an imported (superior) tomato variety, however, it would take more than four years to have much impact on farmers.

BRRI's plant breeding illustrates the way in which success in one crop can pay for many years of less successful research (Appendix E). BRRI has been successful in breeding a number of varieties that are replacing local varieties and older imported varieties like Pajam (see Appendix E). A one percent increase in area of T.Aman under MVs increases the net returns to farmers by $3.4 million if the MVs are replacing Pajam, and by $5.2 million if replacing LVs[2] (Orr et.al.) These returns will continue every year that the new varieties are grown, and will more than pay for the $4 million dollars a year that was invested in this project in ten years.

ARPII-(S) has three main activities that may have an impact on farmers: (1) improving planning (priority setting and management of the system can increase the productivity of agricultural research), (2) strengthening the "core disciplines", and (3) improving the linkage between research and extension through communication programs which, through the FSR approach, should speed the transfer of technology between research and farmers. The first two sets of activities will impact farmers' fields in the next five to 20 years. The Project Paper (PP) specifically mentions the development of technologies such as improved feed, breeding stock and support services for livestock and aquaculture and improved soil, water and pest management practices. Activity three should lead to the adoption of improved technology in farmers fields in the next few years if well adapted

[2]. One percent of T. Aman area is 42,000 ha. The Ministry of Agriculture's Agro-Economic Research Unit estimated the net returns from MV, Pajam and local varieties to be Tk.13,715/ha, Tk.10,837/ha and Tk.9,411/ha, respectively. Thus, 42,000*(13,715-10,837) = 120,876,000 and 42,000*(13,715-9411) = 180,768,000, which, at Tk35 per $1.00, is $3,453,600 and $5,164,800, respectively.

technology is available from the research institutes, or by importing it from other regions of Bangladesh or other countries.

The remainder of the impact section looks at three types of impacts: the major impacts of the project on research productivity and on the linkages between researchers and farmers; the impact of past research and some of the technologies that are in the pipeline; and the utilization of the analysis of past impact and pipeline technologies to provide estimates as to whether farmers' output will in fact improve due to this project.

3.1 Research In Core Areas

The evaluation team subjectively compared terms of reference (Appendix E) of ARPII-(S) specialists with performance. A summary of the latter is given next.

3.1.1 Rice Research

The International Rice Research Institute (IRRI) continues to have a positive effect on research at BRRI. Most of the activities of the team leader appear to be facilitating research and training links between BRRI and IRRI. It is impressive that over a period of 10 to 15 years, the role of IRRI has changed from institution building, technical assistance and research by expatriates to that of partners in research and training. IRRI and BRRI have 19 joint research projects. IRRI has conducted one of its training courses in Bangladesh and hopes to do more training there in the future. Bangladesh was chosen as the site for the international farming systems conference last year and has hosted a number of other international meetings. In addition, BRRI participates in many of the nurseries that IRRI organizes, entering BRRI varieties in these international trials. The importance of these contacts is that BRRI research and training is forced to meet international standards of quality. IRRI training and seminar opportunities also provide an incentive for young scientists to conduct research. Finally, the regular external reviews of the BRRI program by knowledgeable rice scientists have played an important role in research planning and management.

3.1.2 Fisheries Research

The International Center for Living Aquatic Resources Management (ICLARM) assistance has strengthened research and technology transfer by FRI. The aquaculture specialist provided guidance to FRI scientists on both on-farm and on-station research programs and assisted FRI in developing excellent relationships with a large NGO, the Bangladesh Rural Advancement Committee (BRAC), with commercial farmers, with the FSR approaches at BARC, BARI and BRRI, and with the Ministry of Livestock and Fisheries. These relationships have allowed FRI to test their technologies well beyond the limits of

their staff.

3.1.3 Livestock Research

Although he had left by the time of the evaluation, the evaluation team spoke with both Bangladeshis and expatriates about the livestock specialist. These individuals noted this advisor's short stay and lack of interactions with the FSR approach. The team was not able to ascertain the real reasons for the premature departure of this expert.

However, the livestock specialist did visit each of the 19 FSR sites during a two-month period([3]) (4 February-3 April, 1990) with three objectives in mind: (1) to review on-going livestock research, (2) to assist scientists with problem identification and prioritization, and (3) to identify potential agribusiness activities (Rigor, 1990). The consultant concluded from his field visit that (1) the young livestock scientists posted to the FSR sites were doing research with little or no impact (cockerel exchange programs or exotic bird introductions under scavenging conditions) in isolation from the rest of the FSR work, that (2) these staffs did not benefit from guidance from older, more experienced livestock scientists, and (3) that livestock feed shortage problems, followed by internal parasites and related problems, dominated the livestock sector of the rural systems.

According to the livestock specialist's report, "The Livestock Subsystem in Farming Systems Research," during this series of visits to FSR sites, he did assist researchers in differentiating between cause and effect, reviewed on-going livestock research programs, and suggested revised programs for most sites (Rigor, 1990). In addition, he composed lists of suggested agribusiness programs or ideas for each site visited. A total of 9 potential agribusinesses were identified, and are summarized in Table 1.

In contrast, no agribusiness opportunities were identified for these sites: (1) Narhatta FSR site and ARS Bogra; (2) Janokinathpur and ARS, Rangpur; (3) FRI, Chittagong; (4) Naikhong Chari BLRI FSR site, Chittagong; (5) Bagherpara FSR site, Jessore; (6) Kalapara FSR site; (7) Lebukhali FSR site; (8) Kalampur BJRI FSR site (Rigor, 1990).

It is difficult to tell where some of the agribusiness ideas came from. However, the possibility of the harvest of lower (non-productive) sugarcane leaves for livestock feed was presented in a paper ("Status of Farming Systems Research in Relation to Livestock

[3] Since this expatriate advisor stayed only 11 months, this single 2-month problem identification and prioritization exercise in 19 FSR sites puts him in working contact with the FSR approach a minimum of 18% of his time in Bangladesh.
While nowhere near 50%, this is significant and assumes this advisor attended no team FSR meetings or had any other contact with the FSR programs.

in Bangladesh") at a workshop on integrating the livestock component into the FSR approach in Bangladesh (BARC, 1988). This same reference provides summaries of surveys done by BLRI researchers in the first year of FSR in Bangladesh (1985-86) under the NCFSRP. These presentations include discussion of farmer-identified problems and suggested research programs for several FSR sites in Bangladesh (BARC, 1988). Given this background, it appears to the evaluation team that the livestock specialist did contribute both revised research recommendations, new research recommendations, and a list of agribusiness opportunities for several FSR sites across most, if not all, ARIs.

A close reading of the consultant's report reveals a writing style that contains certain critical remarks than might have been interpreted as being personal in nature, rather than being directed toward either an administrative or research system itself. This may provide a clue as to why those individuals questioned about this consultant provided the team with uniformly negative feedback.

Table 1. Appropriate FSR Agribusiness Opportunity per Site, Village, or Region

AGRIBUSINESS OPPORTUNITY	SIT, VILLAGE, OR REGION
Sugarcane leaf ensilage	Puratun Village; Jaipurhat SRTI FSR site; Kanaipur BJRI FSR site; Sreepur BRRI FSR site.
Chick rearing	Kallkapur FSR site, Ishurdi; Hathazari FSR site, Chittagong.
Sun hemp seed production	Saroil, Barind, Rajshahi; Palima FSR Site, Tangail.
Rearing female calves as heifer replacement	Baghabari BLRI FSR site.
Beef fattening for E'id	Jaipurhat SRTI FSR site; Kanaipur BJRI FSR site; Sreepur BRRI FSR site.
Sesbania seed production	Palima FSR Site, Tangail; Kanaipur BJRI FSR site.
Maize grain for poultry	Narikheli FSR site, Jamalpur.
Layer of boiler poultry unit	Trishal FRI experiment site; Sreepur BRRI FSR site.
Encourage fish feed mill to full capacity	Trishal FRI production of nutritionally adequate feed experiment site.

Source: Rigor, 1990

3.1.4 IPM Research

The long term consultant worked primarily with BARC on medium to long range elements of IPM. Few research or training programs were implemented, especially in the FSR-IPM interface, but major contributions were made to IPM. It should be noted that the absorptive capacity of most LDCs for IPM is usually quite low, because many of the traditional tenets based on scouting, economic thresholds, and biocontrol, have limited economic application to smallholders. However, this does not mean that IPM is not, or should not be, an important component of the FSR approach.

In terms of output, the IPM specialist proposed four local training courses (IPM: Magallona, 1990; Magallona: nd2, nd3, nd4), three foreign trainings (IPM: Anonymous: nd2, nd3, nd4), seven scientific visits or study tours (IPM: Anonymous: nd6, nd7, nd8, nd9, nd10, nd11, nd12), and proposed terms of reference for two local (IPM: Magallona: nd8, nd9) and 3 expatriate (IPM: Magallona: nd5, nd6, nd7) consultancies. All of these proposed activities involved issues of IPM. In addition, the advisor developed three TAPPs: an integrated pest management program, a proposal to strengthen the seed pathology laboratory, and a weed management program (IPM: TAPP Project Submission: nd1, nd2, nd3).

Professionally, the IMP specialist and his counterpart produced a 292-page "Action Plan for integrated pest management in Bangladesh" (Magallona and Arangzeb, 1990), and a short analysis of pesticide management and regulation issues in Bangladesh (IPM: Magallona, 1991). In the latter, the specialist made a strong plea for pesticide use safety and safe handling of hazardous materials. These issues should be given serious consideration by the NARS, as many small farmers are inclined by market forces to use older and often less environmentally safe pesticides. These same farmers are also often illiterate, all of whom need strong guidance. Regardless of the advisor's relatively small amount of time devoted to the FSR team, it is obvious that he had many good ideas and tried to improve the quality of IPM in Bangladesh.

Finally, the IPM specialist wrote a concept paper on IPM in FSR (IPM: Magallona, nd1). In this paper, the expert points out the following three major difficulties in the IPM-FSR interface:

(1) there is a wide-spread misunderstanding of IPM in Bangladesh (his point being that IPM is much more than "spray the bush and count the bugs"),

(2) the FSR approaches never take insect or disease ratings during trial monitoring, but may administer controls without reporting such activities in fieldbooks or research write-ups, and

(3) links between OFRD and plant protection scientists are poor to non-existent (the former only visit the latter when a crop is "threatened" with a pest disaster; the latter never visit the FSR sites).

The first factor above has led to a paralysis in strategy evolution vis a vis IPM at the farmer's field level. There is no systematic training for OFRD staff; no forms to fill out at the time of field visits to document the presence and severity of pests; killing jars are never used to transport specimens back to a regional or central laboratory for identification; no attempts are ever made to quantify incidence or severity of crop injuries due to even the most prevalent pests.

Given that IPM should be an integral part of an FSR approach[4], the evaluation team agrees with the IPM specialist that a much greater level of effort in this facet of the system must be put forward by both the FSR staff and the ARI plant protection staff. While this evaluation report is not the forum to present all the recommendations of this specialist's paper (IPM: Magallona, nd1), some key points which represent a synthesis of this paper and the evaluation team members, have been advanced as recommendations by the evaluation team. Only by implementing changes similar to the ones advocated will Bangladesh ever have a chance of adding the important IPM complement to on-going FSR approaches.

3.2. Output of Core Research

The benefits from IRRI's inputs led to a series of rice varieties tailored to the varied ecological requirements of Bangladesh. These varieties will raise yields by replacing local varieties in progressively more difficult environments. In the late 1960s, BRRI scientists played an important role in the introduction of IRRI varieties IR-5, IR-8, IR-20 and Purbachi which spread in the Boro and T.Aman season. At the same time they started their own breeding program, using both IRRI and local genetic material. This program was successful in producing MVs for the irrigated boro crop and aman varieties for regions that are not drought or flood prone and can be transplanted before July 15th. They have recently produced varieties that can be transplanted late (after July 15th) and still yield much more than local varieties or improved varieties like Pajam (Appendix E). The diffusion and impact of these varieties is documented in Appendix E.

BRRI will release several varieties during ARP II(s). BR22 and BR23 were released in 1988 (Appendix E). These varieties yield more than local varieties even if they are planted

[4] It is sad but true that IPM is an often-overlooked component of FSR approaches in other parts Asia and the world. However, given the relatively high level of deployment of pest management personnel to regions and locales of Bangladesh, such that each region has at least one well-trained plant protection professional, there is no excuse for it here.

in September. Since then, BRRI applied to the National Seed Board to release a variety (BR1867-20-1-4) for T.Aman that is shorter duration than BR23, a higher yielding version of Pajam for T.Aman where there are flooding problems, and several direct seeded Aus varieties. More recently, they applied for release of one irrigated boro, one T.Aman, and two deepwater varieties. It is likely that the development of varieties will continue apace and that BRRI, partly financed by ARPII-(S), increased the rate at which new varieties are developed. It cannot be over-emphasized that MVs of rice being released and tested in farmer's fields during ARPII-(S) began their development years before the start-up date of this project.

Fisheries is the one area besides rice in which some important new technology can be partially attributable to this project. Both the seasonal pond fisheries and carp polyculture with poultry seem to be ready to spread rapidly. Two species of fish, Thai sharputi (Puntius gonionotus) and tilapia (Oreochromis niloticus), can be grown profitably in seasonal ponds with only the fingerlings, rice bran, and labor.

In 1988-89, BRAC, on the advice of FRI, tried tilapia in 20 ponds. The next year they expanded to 400 ponds and also tried Thai sharputi which was much more successful. The main constraint is access to fingerlings. To overcome this constraint, FRI has teamed up with BRAC to train women to produce thai sharputi fingerlings. This year they will produce fingerlings to be used in 3,500 ponds farmed by landless or near landless. This could increase production by about 100,000 kgs this year alone.

BRAC cooperators are also producing tilapia in 400 ponds, however, they are not spreading this technology further until FRI has been able to solve technical problems which keep the fish a suboptimal size at harvest. Tilapia reproduces too rapidly, and so farmers end up with too many small fish to earn maximum profit. FRI is now trying two methods to slow reproduction. One uses a reddish species of tilapia which does not breed fast enough to reproduce in the seasonal ponds, and another involves a predator species which eats the fry produced by the tilapia. Both strategies lead to larger fish and more cash for farmers.

The technology for carp polyculture has been fairly well established, but has not spread widely because of the cost of high protein feed (according to FRI). Thus, they are working on a system of poultry-cum-fish in which the droppings from poultry provide all the food the fish need. The constraint then becomes the availability of high yielding chicks, poultry feed, and capital to obtain or lease and clear a pond. Improved carp polyculture and integrated livestock fish seem to be working well in on-farm experiments, but it is still unclear whether this practice will spread widely. However, fish play an extremely important role in the traditional diet of Bangladeshi rural households. For this reason, the evaluation team is optimistic about the potential spread of this improved technology.

Finally, adaptation of the AVRDC "Homestead Vegetable Production Program" (HVPP) continues as an area of collaboration between BARI OFRD staff and DAE BS staff. Begun with the dual objectives of (1) helping to improve the quality of diet of the poorer segments of rural Bangladesh, and (2) seed self-sufficiency for sustainability, the HVPP is still relatively young, having begun in earnest in 1989 (Hossain et al., 1990; DAE/BARI/BARC, 1991).

There is no doubt about the first objective of this program: homestead gardens are desperately needed in rural Bangladesh. By 1991, the combination of DAE BSs and BARI OFRD staffs have spread the HVPP to 100 Upazilas through 6,500 BS demonstration gardens, and 15,000 women's development program gardens (handout notes, R. N. Mallick). This is a final pragmatic example of the usefulness of PL480 funds and applied technology transfer via the FSR mechanism.

Although this program recently received a favorable review (Mannan et al., 1990), the evaluation team has some major reservations about its current sustainability (second objective). The basic issue is that recurrent free seed handout is not sustainable. This issue is covered by recommendations in that section of the report.

3.3 Social Science Component

The long term consultant seems to have fulfilled the components of his TOR, but left social science research at the NARS and in FSR only marginally stronger than he found it. The BARC social science staff is stronger than when he arrived, and the Social Science Network which he initiated has promise as a way to strengthen communication among the social scientists in the institutes. The ability of NARS and BARC to do RRAs has been strengthened, and some social scientists have been trained in using software, survey techniques and applied statistics (Mohammad, 1990). Consultants were hired to conduct various studies, ranging from what appears to be a retired official's description of the government institutions for interfering with markets, to a study on Women in Rural Development that could serve as the basis for further follow-up research on rural women by the NARS. The Maize seed study by a consultant appears to be the basis for a new A.I.D. project.

3.3.1 Human Resources Development Specialist

The Chief of Party, who also served as the Human Resources Development Specialist (and later covered the remaining program of the Livestock Specialist) was instrumental in overseeing the large participant training program and encouraged improvements in the BARC training cell. One of the most significant accomplishments of this Specialist has been to help energize self help groups for farmers. His guidance toward market oriented discussion may be one of the most sustainable contributions.

3.3.2 Planning and Evaluation Specialist

The Planning and Evaluation Specialist felt an obligation to computerize the information sources of this BARC division and helped to establish realistic and verifiable indicators for monitoring planning and evaluation programs. The most significant contributions were to help establish policy guidelines, assist in BARC Sectoral Plans in Relation to the five year plan, and to initiate risk assessment systems in the Division.

3.3.3 Research Facilities Specialist

The Research Facility Specialist served a very important and rather durable role in upgrading the research support and maintenance program throughout a large segment of NARS. The in depth physical inventory of equipment covered the entire NARS and should be a valuable administrative tool in the future.

3.3.4 Communication Specialist

Effective communications is the cornerstone of good research. The Communication Specialist has contributed to the future of research in Bangladesh largely by bringing together the many research literature data bases of the world and making it available to NARS scientists through computer access. This specialist has tried to popularize research findings through the development of newsletters and other tools, however, the BARC team has not exhibited much effort in maintaining these tools.

3.3.5 Senior Research Management Specialist

The contributions to improved research programs by the Senior Research Management Specialist are far-reaching and sustainable if adopted and fully utilized. The development of a prioritized body of activities to accomplish the overall plan, the use of uniform reporting, and the registering and transmission of results for NARS wide use are needed exercises even in a top down system.

3.4 Adequacy of Support Services

Station management seems to be somewhat remote from scientists research specifics. Facilities for research in Bangladesh are relatively good in comparison with most other LDCs. Equipment procurement is slow under the current system, although the total amount of equipment is relatively adequate. Equipment maintenance is fair. Operating budgets are the biggest single concern of scientists interviewed (other than promotion). Inventory management is expected to be improved with the new inventory information data base.

4.0 FARMING SYSTEMS RESEARCH DEVELOPMENT

4.1 Introduction

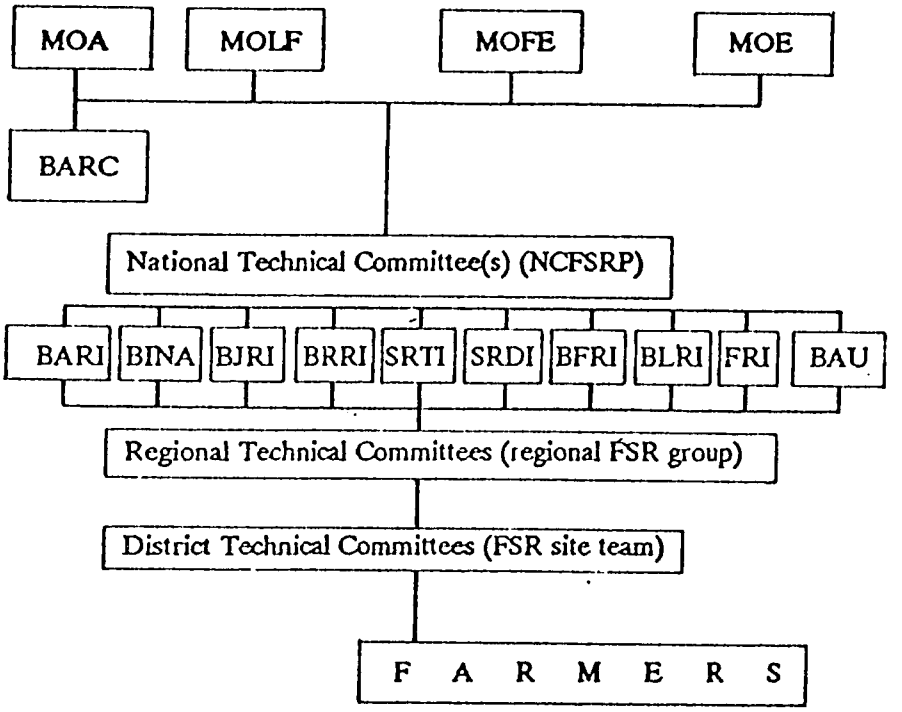
FSR in Bangladesh in BRRI evolved from previous research carried out in the name of Cropping Systems Research (CSR) (FSR: Jabbar and Abedin, 1989; FSR: Rahman et al., 1989). In BARI, FSR evolved from the farm-level fertilizer trials carried out by the Soil Fertility and Soil Testing Institute (which began in 1955) and was renamed the On-Farm Trials Division (1978) and the On-Farm Research Division (1984) (FSR: Jabbar and Abedin, 1989). Many of the underlying concepts in FSR can be traced back to initial interactions between BRRI and IRRI. The concept of the contiguous set of farm fields represented by a large proportion of a village, as the host plots for what is now called a FSR site, was adopted from the IRRI CSR concept.[5]

Now several other Bangladesh ARIs also carry out FSR. The approach is much more holistic (whole-farm) oriented than ever before. One ARI has developed a computer software program (Farm Action) which allows practitioners and scientists to enter details of enterprises in seasonal cropping patterns into a program to assist them in managing and analyzing the labor and cash parameters of these mixed systems (BRRI, Quarterly Report, 1991; personal communication, N. Magor). The evaluation team supports this innovation, and recommends that its use be extended as rapidly as possible to the other ARIs with FSR approaches.

The institutes with FSR approaches now in Bangladesh are BAU, BFRI, BJRI, BLRI, FRI and SRTI. Just in terms of coordination of research, these ARIs represent 4 separate ministries. The simplified top-level organogram for these interactions is provided as Figure 1.

[5]The model of the contiguous parcels in the host village as the FSR site, with a rented office for the local team of FSR practitioners, is still very similar to those to be found in the Philippines and Nepal, for example, two IRRI-based Asian FSR approaches with which the evaluators are also familiar.

Figure 1. Simplified Bangladesh Ministerial Organogram: Complexities of Research-Extension Interinstitutional Linkages



Acronyms Used:

BARC	= Bangladesh Agricultural Research Council
BARI	= Bangladesh Agricultural Research Institute
BAU	= Bangladesh Agricultural University
BFRI	= Bangladesh Forestry Research Institute
BINA	= Bangladesh Institute of Nuclear Agriculture
BJRI	= Bangladesh Jute Research Institute
BRRI	= Bangladesh Rice Research Institute
FRI	= Fisheries Research Institute
MOA	= Ministry of Agriculture
MOE	= Ministry of Education
MOFE	= Ministry of Forestry and Environment
MOLF	= Ministry of Livestock and Fisheries
SRDI	= Sugarcane Research Development Institute
SRTI	= Sugarcane Research and Training Institute

4.2 FSR In Bangladesh

The FSR approach in Bangladesh enjoys a deservedly high global reputation. It is obvious from the evaluation team's visits to many different farm villages that both the staffs involved in, and the farmers affected by, these approaches are generally pleased.[6]

For purposes of the evaluation, the important fact is that an impact is being made at the levels of the farm households, as (1) incomes are improving (through more stress on growth and sale of non-traditional crops and livestock components such as fish and poultry, pulses and vegetables), and (2) more calories are going into these households (through yield increases in the traditional rice crop). In addition, the nutritional level of the region where these changes are occurring is being improved. Overall, the evaluation team gives the FSR approach in Bangladesh very high marks for its contribution to this success.

In addition, the ARPII-(S) FSR specialist has done both an outstanding and a remarkable job in working with his OFRD staff, both in hands-on applications and in training. It is difficult to envision a more effective implementation of FSR in as short a period of time as can be found through the project at OFRD and across the other ARIs in which OFRD comes in contact and works with collaboratively.

With these introductory remarks in mind, the evaluation team was required, through the terms of reference, to evaluate the FSR approach according to some set criteria. These criteria follow, as do the observations of the team.

As evaluators, the reader is cautioned to keep in mind the fact that it is much easier to recommend small mid-term course corrections for a well-run FSR approach than it is for a poorly-run FSR approach. Therefore, the recommendations put forward by the team reflect and, to the extent possible, try to build positively upon, the maturity and high quality of the existing FSR approaches encountered here.

4.3 Effectiveness of FSR Activities at Sites

Currently, the FSR approach is in place in 20 FSR sites out of a total of 30 agro-ecological zones (AEZs). However, each FSR site does not necessarily represent a unique Bangladeshi AEZ, nor is it obvious that a country no larger than the state of Wisconsin needs at least one FSR site in 30 different AEZs.

[6] Altogether, during a total of 11 days of travel to regional and local areas in and near Chittagong, Mymensingh, Sylhet, Rajshahi and Ishurdi, the evaluation team spoke with, interviewed, or met with a total of about 475 farmers; of these, approximately 75, or 15%, were women.

Collaboration between different ARIs was observed in the Chittagong region (between BARI OFRD and BFRI, and between OFRD and DAE SMSs, SMOs, UAOs and BSs), and in the Rajshahi region (between BARI OFRD and BARI pulse breeders, and between OFRD and SRTI). From this small sample, and by interviewing representatives from SRTI, BJRI, BFRI and FRI, it appears that the BARI OFRD sites have served a good function as interface nodes between farmers and researchers of all other ARIs involved in a FSR approach. These nodes have facilitated entry of research on livestock, aquaculture, homestead gardens, and agroforestry components or sub-systems of the farmers' systems.

A bigger question is BRRI-BARI cooperation. The BRRI CSR approach pre-dated that of BARI. There is a feeling of superiority on the parts of some BRRI professionals. This leads to a low level of cooperation between these two major FSR efforts. Although it is questionable whether an LDC with a per capita income of about U.S.$170 afford the luxury of two major FSR programs working in parallel with little communication and few exchanges of ideas, it is possible as long as it receives sufficient donor support to cover the recurrent costs of both programs.([7])

What is striking in rural Bangladesh is the predominance of rice-based systems. Since more than 90% of the farmers of the country have rice as a component crop in at least one season of their system, it would seem natural that BRRI would provide BARI their latest technological findings, in terms of promising rice component varieties and cropping patterns. Since BRRI also conducts farm-level research under a whole-farm approach, it would seem that in addition to MVs of rice, their researchers may have uncovered some other promising component or cropping pattern technologies to share with BARI. The reverse is true as well. Since most BARI systems research includes rice as one component, new or improved sub-systems developed through BARI research should immediately be shared with BRRI.

However, there is not much evidence to support this theoretical interaction. The latest list of Manuscripts of Extension Literature which BARC uses to identify publications for the use of DAE includes four BARI technologies, one each from BFRI, FRI, BAU, BJRI and SRTI, and none from BRRI (FSR: Anonymous, nd5). Since the BRRI DG attended the "Mature Technologies" meeting (Sept., 1990), it must be concluded that no new BRRI technology was ready for advancement this year. One thing is certain, BRRI is producing, testing and verifying new technologies. The question is, how do the other Bangladeshi ARIs and extension services learn about them, and vice-versa?

[7] It should be noted that BRRI uses very little non-GOB funding, so is much less donor-dependent than some of the other ARIs with FSR approaches.

Two evaluation team members conducted their own mini-RRA in northwestern Bangladesh (Rajshahi Region). Using a brief one-page form to facilitate data collection, this group interviewed 11 MOA staff, ranging from SOs to CSOs (Appendix E contains a copy of the form used and all the summarized responses). Ten of the respondents were male; one was female. Of the six who offered an opinion as to their overall impression of the FSR approach as it is being implemented in Bangladesh, five rated it "Good", one "average" and one "poor" (evaluation team RRA Form).[8] From this sample, too small to be representative of anything other than a few opinions from the northwest, it can be concluded that the FSR approach is considered "good".

When these same officers were asked to provide the evaluation team with the "most valuable" and "least valuable" parts or components of the FSR approach in Bangladesh, nearly twice as many provided the team with "least valuable" (a proxy for negative aspects) items (27) than provided "most valuable" (a proxy for positive aspects) items (14) (evaluation team RRA Forms). Since 11 respondents provided 41 positive or negative aspects of the FSR approach (almost four opinions each), this probably indicates that the respondents have both an active knowledge of FSR in Bangladesh, and fairly strong opinions about it.

More negative than positive comments are also to be expected, especially from local and regional staff, because they are closer to the farmer-extension-research interface with all of its problems. However, the evaluation team believes that it is easier overall to list negative aspects of a strong, well-accepted program than it is to list them for a weak, poorly-organized one. The team has relied on some of the more frequent comments to reinforce some recommendations to improve the FSR approach.

The top-ranked problem (n=6), "improved logistical support/more vehicles needed," is universal and could have been predicted without leaving Dhaka. The team cannot think of an FSR approach anywhere which operates with "sufficient" transportation and logistical support. However, the team does not want to dismiss this issue. On the contrary, guaranteed mobility is a mandatory and ongoing prerequisite for successful implementation of FSR. The team assumes that the current Bangladesh government will take the necessary steps to prevent local police superintendents from commandeering BARI OFRD or BRRI FSR vehicles for days at a time, a practice reportedly occurring at the time the team visited the northwest. When insect or disease field ratings need to be made, or when plant stands or harvests need to be measured or taken, the field teams simply cannot afford to be without the full-time use of their vehicles.

[8] One respondent cast two votes, split between "technology generation" with FSR, rated as "Good", and "technology transfer" via FSR, rated as "Poor".

The second-ranked point (n=4), "isolation of work/posting not enjoyable", is also often heard by those reviewing FSR efforts. It is a combination of two facts: (1) often, the FSR site posting is the first one a junior officer receives outside of the ARI headquarters; or, (2) the posting is one at which the officer has served faithfully for several years, service for which he or she believes that some incentive should be forthcoming (e.g., salary or rank increase, posting to regional headquarters from the local site, or posting to Dhaka from the regional headquarters).

This response points out one of the most serious difficulties facing any on-going FSR approach: how can predominantly young, dynamic staff be adequately compensated for the unusually long hours they work, the trying conditions they work under (there are no ceiling fans when you work in the rice paddy), the logistical frustrations they encounter, and the extra time required to establish good working relations between both main-line researchers and DAE representatives? Unfortunately, there are no set formula answers to this question, because each country implementing the FSR approach must function under Civil Service regulations. Unfortunately, each Civil Service functions a little differently from the last (or the next), so what may be a "legal" solution in country A may be "illegal" in country B.

However, the team believes that more can be done in Bangladesh to reward the dedication and hard work of the individual scientists involved in field-level FSR. One suggestion is to adopt an "isolation" clause, whereby all officers receive monetary compensation for postings away from Dhaka (call it a "remote allowance"), with another compensation created for individuals conducting trials off-station in a FSR context, separated and not to be confused with a strict component work carried on in isolation in farmers' fields (call it a "hardship allowance"). While the wording of the labels is not important, the concept of extra compensation for long hours of difficult work should become part of the ARI system.

Secondly, there are other alternatives. One is salary increases at an earlier time than for similar length of service performed solely on-station. Another, which presumably is strictly regulated by the Civil Service, is grade advancement as soon as is possible within the system. Another alternative is preferential nomination for advanced degree study (formal trainings) or preferential nomination for local and/or foreign short courses (informal trainings). An additional alternative is to create a fund for "difficult housing" situations.[9]

Considering all of these alternatives, the evaluation team believes that the Bangladesh bureaucracy can come up with some acceptable combinations of field-specific incentives which are, at the same time, legal and rewarding to field staff.

[9] Such a fund may be necessary in the case of unmarried female scientists posted to the more remote areas of Bangladesh, as they encounter more difficulties in locating culturally suitable housing.

Farmers are generally pleased with the FSR approaches in Bangladesh. In travelling to the regions of Chittagong, Sylhet and Rajshahi, no farmers were encountered who were negative about the programs. However, in all fairness, it must be pointed out that the team did not have time to randomly sample and interview farmers. Thus, all farmers encountered were those who were both working actively with FSR practitioners, and those pre-disposed to meet and speak with visitors. In addition, most farmers were met in large, pre-arranged group gatherings. Obtaining reliable information from an individual during such events is difficult to impossible.

The only negative comment related to the team by farmers was in regard to the seed collection component of the HVPP. Several farmers mentioned that the "program" would have to provide them with seeds again next year. The evaluation team does not view that type of technology transfer as being self-sustaining, and has made several alternative sub-recommendations to address this objective of the HVP approach (FSR recommendation 6a, sec. III).

4.3.1 Effectiveness of Commodity Support

According to the Project Paper for ARPII(S), six consultants are to dedicate at least 50 percent of their time to the implementation of FSR, acting as a mini-team under the leadership of the FSR specialist. However, looking at the SOWs for the Checchi & Co. team, only the FSR and IPM specialists were given those percentages of time dedication to FSR. In addition, three team members had no background in FSR, and getting "up to speed" in it proved difficult. With the exception of the FSR specialist and the ICLARM fisheries specialist, none of the remaining members contributes 50 percent of his time to the FSR approach. The IPM specialist visits FSR sites relatively often, but no farm-level programs seem to have been initiated to address farmer-identified pest problems.

The FSR specialist puts most of his time into FSR. FSR sites cover 103 of the 460 Bangladeshi Upazilas. An inventory of 100 mature FSR technologies was compiled, reduced to 52, and finally reduced to seven for 1991-92 (FSR: Bangladesh Agricultural Research Council, nd; see also section 2. a) 1)). FSR has been institutionalized in BRRI, BARI, BFRI, BJRI, FRI, BLRI, SRTI, and Inter-institutional coordination of FSR activities is increasing, especially in the areas of the HVPP, aquaculture, and livestock. The advisor has been instrumental in training, and arranging training for, 157 professional staff in FSR management, including both Ph.D. and M.S. students in the areas of agroforestry and gender issues. Finally, the FSR specialist has shifted the focus of the FSR approach in Bangladesh to include more emphasis on landless, marginal households, and women's development issues and roles.

4.3.2 Efficiency of Allocation of Resources

There are two trains of thought in terms of the eventual coverage of Bangladesh by the FSR approach. One is that a minimum of 30 FSR sites are needed, one per AEZ. The other is that the current 20 sites are too many to manage properly, and that the number of active FSR sites should be reduced to eight to twelve.

On the plus side of the argument for larger numbers of sites, the addition of farming systems aspects to what began as a cropping systems approach has come about much more efficiently because trials are concentrated at FSR sites with fairly long histories. Making inroads with the farm families in a given village has already taken place, so adding in a livestock poultry component, an agroforestry indigenous tree or bamboo component, a fisheries seasonal fish pond or ditch, or perennial fish pond component, has been much simpler than an addition begun from scratch in a new village setting by these ARI staff without known established presence in the area.

In addition, the evaluation team did not encounter any reported lags in disbursement of ARPII-(S) funds in support of local FSR approaches. The same reaction seemed to be forthcoming from those who had received supplies or equipment from the project or project funds.

On the minus side of greater numbers of sites, management already seems to be spread thin. Data is collected which is never analyzed. Some data, namely socioeconomic and pest management, are collected rarely, if at all. Impact assessments are not done as often as they should be making it difficult to justify the value of the approaches to donors.

After weighing both sides of the argument, and because livestock, fisheries, agroforestry and horticultural crops have been integrated pretty well into most of the FSR approaches, the evaluation team suggests a gradual consolidation of FSR sites to a lower number, perhaps 10-15 for all of Bangladesh. This phase-out should be accomplished by handing over those sites with the oldest histories to extension (see section II.D., for the details of this process). As the FSR approaches move toward consolidation, they will have time to make themselves more client (farmer) responsive. Finally, these are to be viewed as temporary, with "research" lives of three to five years.

4.3.3 Integration of Socio-Economic Component

The ARPII-(S) FSR specialist has been involved in three different adoption study activities. The first was with BRRI/IRRI rice farming, the second was to examine some of the components of technology at each of the BARI FSR sites, and the third was as a participant on an interinstitutional team (composed of representatives of BARI, DAE, BRRI and others).

Lately, the FSR advisor has been encouraging the successful use of the Rapid Rural Appraisal (RRA) tool for the quick retrieval and synthesis of rural data. Four RRAs were carried out in the past year. They were: (1) Kurigram small and marginal farmers, October, 1990 (FSR: On-Farm Research Division, 1990d), (2) Tangail buried pipe deep tubewell farmers, October, 1990 (FSR: On-Farm Research Division, 1990c), (3) Sylhet District research and development needs, April, 1991 (FSR: Bangladesh Agricultural Research Council, 1991), and (4) Cyclone disaster area rehabilitation, June, 1991 (report forthcoming; handwritten notes only). These RRA activities have involved multidisciplinary teams of ARPII-(S) and ARI scientific staff interviewing farmers and Upazila or village level key informants in selected target areas of the country, in collaboration with extension. The groups obtain lists of important farmer-identified problems, and follow-up by brainstorming for logical research or extension solutions.

4.3.4 Effectiveness of FSR and Women

4.3.4.1 Women in Research

In the Ishurdi OFRD, four of the ten professional staff members are women. Members of the evaluation team observed excellent presentations to target farmers and/or homemakers. In the first instance, a woman fisheries scientist was briefing villagers on her fortnightly polyculture carp pond sampling activity. She spoke out doors to 38 men (and ten women who stood listening and peeking over the walls of a compound), and 55 children.

The second woman scientist was delivering one of a series of lectures on women's development to an outdoor group of 63 women (the village has 60 families in it), 30 children and four infants on the topic of raising poultry in bamboo pens. This scientist illustrated her presentation with a stove she had built herself from locally-available materials (to warm the chicks during the first 15 days following hatch), and locally-available feed sources.

The DAE employs 600 women at the BS level, a little less than 5 percent of the 12,640 BSs in Bangladesh. According to the DG of DAE, it is hoped that the majority of these women work in development of the homestead in rural Bangladesh, not alongside the men in the fields (personal communication, S. Islam). Given the importance of the homestead to the potential development of rural Bangladesh, through improved diets and money-raising small-scale agroforestry, aquaculture and household gardens, this seems to the team to be the best use of these women's skills, time, and talents.

This strategy also fits in well with the recommendation of a recent study of rural Bangladesh women (FSR: Burch and Rahman, 1990), where these authors point out that rural women's participation in agriculture is greatest in homestead production, and who recommend that (1) the FSR approach be broadened to include a whole farm approach,

also placing increased emphasis on "Intensified vegetable production, homestead based livestock rearing, poultry raising, fish farming, and agroforestry programs..." (ibid., p. iv), and (2) a women's agricultural production program be established on a pilot basis in several selected FSR sites. These components were observed at several of the sites visited by the evaluation team.

4.3.4.2 Relevant Production Research for Women

As noted in the previous section, there are several areas of current ARI and extension work activities which directly benefit Bangladeshi rural women. These include: (1) the Women's Development Program, including the improved poultry project[10], (2) the HVPP[11], (3) agroforestry work to enable Bangladeshi homesteads to grow more easily-accessible multi-purpose trees near homes (to reduce the firewood deficit), and (4) the SRTI FSR program, including the grafting of improved jujube and the increased production of homestead mango by hormonal sprays to reduce the time and effort involved in harvesting these two common household products.

BRRI has initiated a study in rainfed areas of Kamalganj and Sitakund on women's activities in farm business and data analysis, and Women in Rice Farming Systems (WIRFS) started in an upland area near Joydebpur in collaboration with the on-going FSR site there (BRRI Quarterly Report, 1991). Emphasis in the latter is through some re-training given to two female field staff.

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[10]The OFRD Women's Development Program scientist estimates that each woman participating in the improved poultry project will earn about TK 4,000 annually (through the sale of eggs and birds for meat). Of the three women participants who answered the evaluation team's question, "What did you do with the proceeds this year?", one answered, "paid off a loan from the woman's cooperative," a second answered, "bought more chicks," and a third replied, "bought HYV seed and fertilizer."

[11]The only problem with the HVPP vis a vis rural women is the fact that few have any extra time on their hands. One study (FSR: Mannan, 1989) shows that rural women in Bangladesh already work quite long hours. This may be another reason why seed collection and preservation may not take place as envisioned by those responsible for the HVPP: rural women simply do not have the time to collect the seeds nor the time or patience to instruct their children how to do so. The DAE BSs may have to give such trainings to responsible, older children in each participating HVP household.

4.4 Proven Technologies From FSR

4.4.1 Outputs of FSR

4.4.1.1 Proven Technologies Developed

From 100 advanced technologies developed by all Bangladesh ARIs, 52 were selected and described in a recent BARC publication (FSR: Bangladesh Agricultural Research Council, nd). These 52 technologies are the output of the FSR approach in Bangladesh. These technologies, listed by either cropping pattern or component, and by the ARI responsible for their development, are provided in Table 2.

4.4.1.2 Technology Packages Developed

What "Mature technologies" have been developed and released?

Verbal and written (FSR: BARC, 1991) sources refer to the "eight mature technologies". Other sources (IPM: Magallona, nd1) refer to "six mature technologies." However, the evaluation team has been able to locate three possible lists of mature technologies. The first list (FSR: Anonymous, nd5) contains nine, while the second (FSR: Bangladesh Agricultural Research Council, nd) and third (notes prepared for the evaluation team by R. N. Mallick) lists contain seven. It is not clear why there are some differences between the seven selected synthesized "mature" FSR technologies from the final two lists.

The three lists (LISTS 1, 2 amd 3) of "nature" technology candidates follow. Other reference is made to technologies transferred later in the report (Sec. 5.1.2).

However, the evaluation team raises these questions in regard to the mature technologies:

1. Where does the "8" come from?
2. Why are none of the lists the same?
3. What is the **ACTUAL** list of "mature technologies?
4. How were these selected from 52? The 52 from the 100?
5. Where are BRRI's "mature" technologies?
6. Do these only represent technologies generated using PL480 monies for support?
7. Did BRRI receive some PL480 funding?

Table 2. Component Technologies and Cropping Patterns

FROM BARI:
Cropping Patterns:
1. **Homestead Vegetable Program (HVP)[12]
2. B. Aus Rice Lentil + Mustard
3. Maize-Fallow-Wheat
4. Boro Rice-Green Manure-T. Aman Rice
5. Boro Rice-T. Aman Rice Mustard
6. Green Manure-T. Aman Rice
7. **Maize T. Aman Rice Potato
8. Green Manure-T. Aman Rice + Chickpea + Linseed
9. Boro Rice/Green Manure-T. Aman Rice-Mustard
10. Maize-Mungbean-Mustard
11. **Green Manure-Potato + Garlic + Pointed Gourd
12. Mungbean [for grain or GM]-T. Aman Rice-Wheat
13. B.Aus Rice-T. Aman Rice-Potato
14. Boro Rice-T. Aman Rice-Mustard
15. **Green Manure-T.Aman Rice + Chickpea + Linseed
Component Technologies:
16. Sunflower
17. Wheat (under reduced tillage)
18. Potato (under zero tillage)
19. Chili + Maize (intercrop)
20. Field Pea + Maize (intercrop)
21. Grass Pea + Maize (intercrop)
22. Maize (in zero tillage)
23. Boro Rice (under zero tillage)
FROM BJRI:
Cropping Patterns:
24. Jute-T. Aman Rice/Grass Pea

Table 2. continued

Cropping Patterns (con't):
25. Jute-Eggplant
26. Jute-B. Aman Rice-Chickpea
27. **Jute-T. Aman Rice-Wheat
28. Jute-Radish-Wheat + Lentil
29. Jute-Wheat
30. Jute-Potato
31. Jute-Mustard
32. Jute-Garlic
33. Jute-Chili
34. B. Aus Rice-B. Aman Rice-Chickpea + Linseed
35. T.Aus Rice-T. Aman Rice-Wheat
36. Jute-T. Aman Rice Tobacco (Vir)
37. T.Aus Rice-T Aman Rice-Tobacco (Bidi)
38. B.Aus Rice-B.Aman Rice-Mustard
39. Jute-T. Aman Rice-Wheat
Component Technologies:
40. Jute retting-Taro + Potato
41. Late Jute seed production + Red Amaranthus
FROM BAU:
Cropping Patterns:
42. T.Aus Rice-T. Aman Rice-Mustard
43. T.Aman Rice-Boro Rice/Green Manure
44. T.Aman Rice-Boro Rice
45. **Jute-T. Aman Rice-Wheat
46. B.Aus Rice-T. Aman Rice-Wheat
47. Aus Rice-T. Aman Rice-Potato

FROM SRTI:
Technologies:
48. **Planting techniques of Sugarcane
49. Sugarcane + Potato (intercrop)
50. Sugarcane + Potato (with mulching)
51. Furadan 3G (effect on Sugarcane)
52. Sulpur (effect on Sugarcane)

(Source: FSR: Bangladesh Agricultural Research Council, nd)[12]

Table 3. Technologies Selected From the 52 (Filtered from the original 100)

Cropping Patterns from BARI:
1. **Homestead Vegetable Program (HVP)
7. **Maize-T. Aman Rice-Potato
11. **Green Manure-Potato + Garlic + Pointed Gourd
15. **Green Manure-T. Aman Rice + Chickpea + Linseed
Cropping Patterns from BJRI:
27. **Jute-T. Aman Rice-Wheat
Cropping Patterns from BAU:
45. **Jute-T. Aman Rice-Wheat
Technologies from SRTI:
48. **Planting techniques of Sugarcane

(Source: FSR: Bangladesh Agricultural Research Council, nd)

[12] Cropping patterns or component technologies marked with asterisks -- ** -- also represent one of the synthesized "mature" technologies being promoted by BARC in 1991-92.

Table 4. The 7 "Synthesized" FSR Technologies Proposed for Major Promotion in 1991-92.

1. Homestead Vegetable Program (HVP)
2. Maize-T.Aman-Potato
3. Green Manure (GM)-T. Aman-Potato
4. Jute-T. Aman-Wheat
5. Rice-cum-Fish Culture
6. Spaced Transplanted (STP) Sugarcane
7. GM-(Potato + Garlic + Palwal)

(Source: notes prepared for the evaluation, R.N. Mallick)

4.4.2 Case Studies of FSR

In addition to the case study for bamboo shoot propagation (Appendix D), there are six cases in FSR worthy of mention. Five of them are presented briefly here. The sixth, sugarcane propagation and paired row spaced transplanting (STP) technique, appears in Appendix-D because of its length.

4.4.2.1 Cyclone Disaster Response

The RRA tool was used in two areas of the Chittagong cyclone-damaged region: Anwara and Banskhali. A tool which has been designed to assist professionals in obtaining a quick overview of an area, RRA is ideally suited to disaster assessment. The evaluation team was briefed in Chittagong on the post-cyclone situation at both locations (FSR: Anonymous, nd2) and visited Anwara. Banskhali had received too much rainfall the previous 24 hours, and could not be entered, as the roads were under water. Summaries of the two RRA activities included lists of problems and needs as well as suggestions for action.

4.4.2.2 Homestead Vegetable Production Program (HVPP)

The HVPP was first initiated in 1985, but really began to spread in 1989-90 (HVPP: Mannan, et al., 1990). Based on the AVRDC 6m X 6m plot adapted to Bangladesh, there are now several thousands of these gardens throughout more than 100 Upazilas in Bangladesh. These gardens are implemented in a joint project between OFRD and DAE BSs, with some gardens being located with women on the homestead through the OFRD women's development staff of women researchers. The HVPP is another case of the

extremely good use of PL480 funds in support of the applied interface between research and extension.

The dual objectives of the HVPP are:

1. to provide year-round vegetables for the poorest rural households in Bangladesh, and

2. to allow farmers to save their own seeds for perpetuation of the backyard garden plot.

Unfortunately, because of the cyclone this spring, the evaluation team did not see one single garden which would qualify as a demonstration garden. Also, few, if any, households are willing, capable, or able to save sufficient remnant seed from the vegetables to allow them to repeat the layout the following year. This implies that the HVPP, as currently implemented, is not a sustainable part of the household system. There are two reasons for this:

1. As the team has seen so dramatically in the Chittagong region, natural disasters (the cyclone and follow-up tidal surge and the tornadoes of 1991) can completely destroy one of the three main seasons of vegetables in these beds, making seed production and collection impossible for all vegetables in that season's rotation.

2. Many participating farmers said that they either cannot, will not, or do not know how, to save seeds.

For both reasons, the sustainable objective of the HVPP is endangered as this component of the FSR technology is presently being implemented. The evaluation team has made a series of recommendations to address this problem.

4.4.2.3 Plant Breeding at Bari and BRRI

BARI's Ishurdi station, if not in fact, in practice at least, is the headquarters for pulse breeding in Bangladesh. Pulse breeders routinely incorporate their advanced lines into the OFRD farm-level trials. In addition, a BINA improved mustard variety, BINA 3, is included in Ishurdi oil seed evaluation trials. At BRRI, breeders have been using the MLTSs and FSR sites for more than a decade to filter final varieties prior to submission to the National Seed Board for release (personal communications, J. McIntosh, A. U. Ahmed and M. N. Miah, BRRI, 1991). These examples demonstrate institutionalization of the FSR approach at the regional and FSR site levels. It is also the highest form of utility for any FSR approach to provide a useful service to NARS station-based scientists.

4.4.2.4 SRTI (See Appendix-D)

4.4.2.5 Ishurdi Fish Polyculture

FRI, assisted by the ICLARM expatriate aquaculture specialist and several local staff, is implementing integrated permanent fish ponds and temporary fish ponds and ditches into several of the FSR sites in Bangladesh. The permanent polyculture ponds, stocked with six species of carp ranging from top to mid to bottom feeders, tend to be owned by more than one owner (brothers, for example), or at least those with a bit more land (these ponds occupy approximately 1000 square meters).

The temporary ponds and ditches are reserved for quick-reproducing Tilapia species, as they are not filled with water year-round. These project ponds and ditches are more appropriate for smaller land-holders and even for landless households.

These ponds and ditches appear to be moving well into villages, assisted by the importance of fish in the Bangladesh diet, the entre provided by existing FSR contacts, and the attractiveness of the research itself. Each fortnightly sampling of the pond is a community event, well attended by men, women, and children of the village.

An issue for the MOLF to resolve is that of cost. While neither technology is very expensive, digging a pond and stocking it with fingerlings costs about TK 1,600. This cost is currently being covered by the ARIs. The evaluation team supports the ICLARM specialist in recommending that original costs be recovered, in cash or in kind, following the first pond or ditch harvest. The program must strive for cost recovery and re-investment of these start-up monies with other farmers in other villages, allowing more ponds and ditches to be established with no additional funds.

4.4.2.6 Ishurdi Women's Development

Team members only attended one women's development presentation (near Ishurdi), which was both extremely interesting and very well attended.[13] The program is designed to get a bit of cash into the hands of the homemakers of the village. This is currently being done by encouraging women (and their older children) to raise penned chicks for the sale of both eggs and meat. Pens are constructed of local materials (bamboo), along with a locally-made stove to warm chicks during their first 15 days after hatch, developed by a woman scientist posted to Ishurdi. Through a woman translator,

[13] Sixty-three women were in attendance, in a village of 60 homesteads. This is an obvious demonstration of interest.

the women expressed their appreciation for this program.[14] The positive impact this women's development program seems be having, and the monies being earned by them, make this an extremely valuable addition to the FSR approaches.

4.5 BARC Coordination of FSR

There is evidence at the local level (from evaluation team member's observations in the Chittagong and Rajshahi regions) that interaction is occurring between ARIs and between ARIs and DAE. In Chittagong, the FRI collaborates with the local OFRD by providing innovative-technology bamboo budding stock for propagation and trials on-farm. North of Chittagong in Noakhail, the DAE BSs collaborate with BARI OFRD staff in implementing the HVP (supported by PL480 monies). In Ishurdi, several interactions occur: (1) The OFRD staff support the SRTI FSR approach (with 3 staff members), (2) The Ishurdi RARS pulse breeders include BINA-developed varieties in their regional germplasm evaluation trials, (3) Ishurdi pulse breeders depend on the Ishurdi OFRD farmer's verification trials to select from their advanced lines those most appropriate under farmer's conditions.

While none of these interactions shows cooperation at the top levels of FSR, the fact is that they would not take place if there were not agreement that they should take place at the national FSR level. The BARC-ARI organizational structure is such that these local interactions would not occur without approval from respective headquarters.

The evaluation team would like to see many more such interactions developing and occurring over the last two years of the ARPII-(S), setting the basis for the future of inter-institutional and research-extension interactions in Bangladesh. To allow this to occur, much more emphasis needs to be given to bottom-up planning and prioritization of farmer-identified problems. These are covered in more detail in the following section (II.D.), and among the recommendations (Section IV, FSR, nos. 1 and 2a).

[14] Just as the FSR sites and approach have allowed agroforestry, aquaculture and HVPP an easier entry into the villages, so too could this women's development program be an entry point for many types of additional educational materials for rural women. For example, some of the women BSs are introducing hygiene, sanitation, dietary consideration and even family planning into their contacts with rural homemakers. There is no reason why the DAE could not share some of their training materials, which cover these additional topics, with the OFRD and other FSR approach women development scientists.

5.0 FARMING SYSTEMS-TECHNOLOGY TRANSFER LINKAGES

5.1 Technology Transfer Mechanisms in Place

It is not obvious that extension agents work closely with the FSR researchers at any FSR sites, except when arrangements are made locally. Of course, one problem is that the World Bank-financed T&V system of extension takes the opposite approach from FSR. T&V assumes both rigid contact schedules between Block Supervisors (in the case of Bangladesh) and farmers, and the ready availability of on-shelf technology which is already completely adapted to the differences of each local situation. Unfortunately, farmers have referred to the former contacts as "Touch and Vanish", while seldom have improved technologies been locally adapted. One of the major roles of FSR has been to systematically address local issues of adaptability. While the concept of T&V is valid, it is ineffective if it precedes the process of adapting improvement to local conditions.

Meanwhile, in the early 1980s, it was recognized that FSR included aspects of both research and extension and, for this reason, could not be defined as only FSR. For this reason, the "/E" was added to FSR, resulting in the Farming Systems Research and Extension (FSR/E) approach.

At issue here is the progression of FSR/E activities. A normal progression would be:

1. exploratory trials (on-station) to,
2. verification trials (both on-station and on-farm) to,
3. demonstration trials (on-farm) to,
4. production trials (on blocks of farms).

Given a specific cropping pattern, progression from on-farm verification to block production may take three o. four years. However, some OFRD FSR sites (e.g., Ishurdi) have been in continuous operation for as long as eight years. It is possible some BRRI sites are even older. These "advanced" FSR sites host a continuum of trials, from verification through production stages, as new components and cropping patterns are continuously being introduced into the existing, but evolving, systems. These sites include rented site headquarters buildings (local houses). The dispassionate observer gets the impression that such sites are mini sub-stations. Proliferation of research sub-stations is not, however, one of the goals of the FSR/E approach. Rather, FSR sites must evolve, both in terms of the stages of technology being tried there, and in terms of the interaction between research, extension, and farmers.

One disconcerting fact confronting the evaluation team is the relatively poor linkage between research and extension in Bangladesh. This is due in great part to three organizational factors: (1) the artificial separation between the MOA ARIs and the DAE, (2) the emphasis upon "official technology" having to be approved from the top down in both the MOA ARIs and the DAE, and (3) the proliferation of ARIs outside of the MOA (BFRI, FRI, BLRI, SRTI), several of which have their own small extension services.

What is needed in Bangladesh in this regard is research and extension working together to re-train, re-tool, and re-equip extension agents to deal with improved technologies which are not handed over to them on single-page fortnightly impact point contact sheets. What is occurring on a small scale already can be done on a wider scale. Formally and informally in many Upazilas, extension is incorporated into advanced FSR trial work at each FSR site, either in hands-on or in classroom trainings.([15])

As trials move from verification to demonstration and finally to (block) production, the involvement of local DAE agents, block supervisors, moves up from a small percentage of total involvement (assumed here to be about 10 percent) to nearly 100 percent of total involvement (assumed to be about 95 percent) in the spheres of responsibility and management as the split occurs between research and extension (Table 5). There is little evidence that this dramatic shift of responsibility is taking place at any FSR site, mainly for the organization and administrative problems noted above.

Table 6 demonstrates that, while neither research or extension are never completely outside of the overall "involvement" with a set of trials, their roles are greatly diminished in comparison with that of the farmer, especially toward the end of the field trial stage continuum. This figure also demonstrates that farmers are never excluded from involvement in any set of field-level trials. Thus, even strict "researcher-managed" trials involve the host farmer to some degree (assumed for purposes of illustration to be 20 percent). This is done to retain a high degree of interest on the part of the farmer, and to make the transition of management of the technology, from research to extension to farmer, proceed as smoothly as possible.

[15] Informal collaboration between OFRD and SRTI staff and BSs and UAOs was observed in both Chittagong and Rajshahi regions (Anwara Upazila in the former; Rajshahi and Ishurdi Upazilas in the latter).

Table 5. Proportion of Relative Involvement in Extension and Research

	Verification Trials	Demonstration Trials	Production Trials
Extension:	10%	70%	95%
Research:	90%	30%	5%

Table 6. Proportion of Relative Involvement in Extension, Research, and with Farmers

	Verification Trials	Demonstration Trials	Production Trials
FARMERS:	20%	50%	75%
EXTENSION:	10%	40%	20%
RESEARCH:	70%	10%	5%

The evaluation team believes that the FSR approaches would benefit from a more systematic system to incorporate farmer-identified problems and priorities into their annual work plans. To accomplish this, an RRA can be used in a joint meeting of farmers, researchers and extension personnel, along with laptop or notebook computer and decision-making software. Out of such a context can come both farmer-identified and ranked problems, and prioritized research and extension agendas for the following season or year. Details of this approach are provided as Appendix E.

5.1.1 Exchange of Information

An impressive amount of dissemination materials have been assembled to assist the extension transfer of technologies developed by the FSR approach. Produced this year have been (1) 40,000 copies of the HVPP Extension Bulletin, (2) 30,000 copies of the HVPP Extension Folder, and (3) 60,000 copies of the HVPP Extension Fact Sheet. In addition to these HVPP materials, the following technology transfer materials have been produced: (4) 1 Training Manual (Mallick, nd1), (5) 17 sets of Slide-Audio Tape Modules, and (6) 2 sets of Video Cassettes. The only short-run problem with these materials is that all of the first three types (the traditional extension materials) were produced in support of the HVPP. Currently, there are no traditional extension support materials for the other six mature technologies which DAE is supposed to emphasize in 1991-92, although all "mature technology" has had extension materials drafted and much of it has been

reviewed (handout table, N. R. Mallick), as the following table shows:

Table 7. List of Manuscripts of extension literature for NARS (planned to be published by BARC)*.

Subject (cropping pattern)	Draft	Review	Current Stage of Printing
1. HVP (BARI)	Drafted	Reviewed	Printed
2. Bamboo propagation and preservation technologies (BFRI)	Drafted	Reviewed	_____
3. Pond fish culture (aquaculture: FRI)	Drafted	_____	_____
4. Rice-fish/shrimp culture (BAU)	Drafted	Reviewed	_____
5. Maize-T.Aman-Potato (BARI)	Drafted	Reviewed	_____
6. Jute-T.Aman-Wheat (BJRI)	Drafted	Reviewed	_____
7. Spaced transplanting (STP) of sugarcane (SRTI)*	Drafted	Reviewed	Printed
8. Green manure-T. Aman Chickpea (BARI)	Drafted	_____	_____
9. Green manure-Potato + Garlic + Pulwal (BARI)	Drafted	_____	_____

* Two Extension Bulletins in Bengali on sugarcane transplanting were given to the evaluation team at SRTI headquarters, Ishurdi, Bangladesh, although the reference table above does not list any SRTI publications as reviewed or printed yet. These two publications may represent another source of publication process and or funding.

In addition, the FSR specialist has been involved in the training of 120 BSs and 327 women volunteers, just in the PL480-supported HVPP.

5.1.2 Type and Number of Technologies Tested

5.1.2.1 Farmer Field Days (FFDs)

OFRD HVPP 1 (1989-90): 40 in 23 Upazilas.

OFRD HVPP 2 (1990-91): 730 planned for 100 Upazilas (70 through DAE Bss and 30 through the women's development volunteers).

BRRI FSR (1990): several for joint BRRI/BDWB/IRRI rotational irrigation project farmers near Rajshahi (with over 500 farmers attending each one).

5.1.2.2 Multi-locational Testing Sites (MLTSs)

BRRI FSR (1990): six locations of irrigated rice; 15 locations of rainfed rice trials. BRRI maintains about 40 total sites, many in collaboration with local extension and about half managed from regional stations for the farm-level testing of new varieties and technologies. The trend in 1991 is to continue to bring more of the MLTs under the direction of regional station management.

BRRI FSR (Proposed, 1991): 42 total sites, distributed by ecosystem as follows: (1) flood free irrigated - 13; (2) barind tract irrigated - 3; (3) rainfed lowland favorable - 19; (4) deepwater winter irrigated - 3; rainfed upland favorable - 4. These MLTs will be carried out by the headquarters scientists as well as by scientists from the five regional stations located at Habiganj, Rajshahi, Comilla, Sonagazi, and Barisal.

5.1.2.3 Pilot Production Programs (PPPs)

OFRD: Six technology transfer projects have been prepared. They carry a total cost estimate of TK 48,360,000. Of these six, only the HVPP, at a cost of TK 38.00 lakhs of PL-480 monies, was implemented (cost to date: TK 14,200,000 for 100 Upazilas). Other technology transfer expenditures include: (1) the Barind Project (TK 1,970,000), (2) the Systems Research Project (TK 6,040,000), and (3) the Integrated Model Project (TK 5,530,000) (handout notes, R. N. Mallick).

BRRI FSR: None mentioned.

5.1.2.4 Demonstrations

OFRD HVP 1 (1989-90): 2,000 garden plots demonstrated in over 100 Upazilas.

OFRD HVP 2 (1990-91): 6,500 garden plots being demonstrated in 70 Upazilas in collaboration with DAE's BSs and 15,000 garden plots being demonstrated in 30 Upazilas through women's development volunteers.

BRRI FSR: An unspecified number of demonstration gardens are being placed with regular FSR site collaborative farm families. These activities began in 1990.

5.1.3 Existing Technology Transfer Mechanisms

5.1.3.1 Public Sector

The types of public sector technology transfer methods being used by the OFRD teams are: (1) extension orientations, (2) extension trainings, (3) farmer field days, (4) trial monitoring and (5) trial evaluation. In addition, demonstration trials are separated into these four groups: (1) single demonstration trial, (2) cluster demonstration trial, (3) general cooperator demonstration trial, and (4) women's development demonstration trials.

Another type of public sector technology transfer involves direct research-to-farmer extension. This type of technology transfer mechanism is being used by SRTI for the spread of the STP technology (see the SRTI Case Study, Appendix D).

Finally, there are two additional methods of technology transfer. The first is the HVPP. The HVPP is a joint effort between BARI OFRD teams and local DAE staff, supported by PL-480 funds. The second is the Cyclone Disaster Area Rehabilitation. In the second instances, an RRA was used to quickly identify problems in the Upazilas of Anwara and Banskhali following the 1991 cyclone.

5.1.3.2 Private Sector

5.1.3.2.1 Sugarcane and Food Industries Corporation

The Bangladesh Sugarcane and Food Industries Corporation (BSFIC) has an extension service. Agents also arrange for credit packages for collaborating farmers to allow them to purchase approved input packages for enhancing their sugarcane production. Since BSFIC does not "approve" of the SRTI STP improved technology, loans for farmers adopting it cannot be given. The evaluation team recommends closer collaboration between SRTI and BSFIC.

5.1.3.2.2 Sylhet Private Farmers

The Community Farming Services Group of Sylhet is an association of 23 farmers led by an inspired former airline pilot who turned to farming after Bangladesh gained its independence. This former pilot had a latent interest in agriculture and a strong interest in helping the rural poor of the area. By following recommended agricultural practice carefully, this new farmer registered record rice yields and gained international recognition. This gentleman, Mr. Emdadur Rahman has provided starter capital, advice and encouragement in an FSR approach to holistic enterprise. His educational

background has helped small farmers to use credit wisely, spread their farming risks by engaging in a multiple of small enterprises, selling collectively and purchasing inputs together. The group meets often and has developed an effective attitude for utilizing waste products in a money earning manner.

Members of the Contract Team staff have been contacted frequently and are credited with many valuable suggestions such as the manufacture of small power agricultural tillers, threshers, and driers. The group uses a Chinese technology to turn rice husks into charcoal briquettes.

Some key indicators of diversification are evident in the following:

1. 48 percent of the farmers do triple cropping,
2. 70 percent own fish ponds of varying sizes,
3. 74 percent are engaged in agriculture, 26 percent are engaged in agri-related businesses,
4. 83 percent used credit of some kind, and
5. 60 percent of the land area is serviced by pump irrigation.

Bamboo predominates in most landholdings with other trees including banana, jackfruit, mango, betelnut, coconut and lemon. For those with livestock, the average holdings were five buffaloes, two cows, 25 chickens and 37 ducks. Most of the farms supplemented their income with vegetable production.

This grass roots association is to be commended for its excellent example of farmers doing things for themselves. It is hoped that this meaningful example will encourage other small farmers to realize the benefits of working together in the holistic approach to agricultural development. The evaluation team recommends that a small fund be set up and made available for this type of progressive leader-farmer to be reimbursed for transportation and food costs for hosting farmer, extension agent, and researcher trainings.

6.0 HUMAN RESOURCE DEVELOPMENT

A two pronged assessment of human resource development is requested in the SOW of the ARPII(S) Evaluation. The first is an assessment of the adequacy of time, of amount, and quality of the scientists in place in the NARS. The second assessment is in terms of results of some specific manpower development activities aimed for in the USAID ARPII(S).

6.1 Size and Quality of Scientific Staff

Size

The size of scientific staff of the NARS has been assessed with reference to two periods, 1987/88 and 1990, because comparable data are available for these periods. Data for 1987/88 were taken from ASR, UNDP/GOB (1989) and those for 1990 are from the Human Resources Study of BARC (1990).

Total scientific staff of the NARS numbered 1,350 and 1,337 respectively in the two periods under consideration, representing an absolute decline in the overall staff numbers of the NARS. This overall decline was the cummulative result of staff declines across five institutes, namely BARI, BRRI, BFRI(FOR), BJRI and BTRI.

In terms of size, BARI heads the list followed by BRRI, BJRI and BARC- the size varying from 467 in BARI to 102 in BARC. The middle-sized institutes are FRI (FISH), SRTI, SRDI, BFRI and BINA in descending order. Actual number of scientists vary from 82 in FRI to 51 in BINA. BLRI and TRI are rather small-sized institutes with 37 and 21 scientists respectively.

Adequacy

With 1337 scientists, the NARS is fairly large and the scientific staff is engaged in research covering all the main sub-sectors of agriculture crops, livestock, fisheries and forestry. The overall staff position is satisfactory as revealed by the scientific staff of BARC in the meetings with the evaluation team.

Although satisfactory in the overall examination of the percentage share of different products in the agricultural GDP and percentage share of scientists involved in research on the products concerned, some areas with surplus/deficit scientists have been identified (Appendix E) (past agricultural performance and the development policy are also kept in mind). Rice, pulses, and livestock clearly stand out as areas with fewer number of scientists than are justified by their percentage share in agricultural GDP. Sugarcane

shows a surplus in scientific staff.

Quality of Scientists

Assuming that higher levels of skills are associated with higher degrees, the NARS exhibit a spectrum of highly skilled scientific staff with 13 percent having Ph.D. and Post Doctoral training, 61 percent with M.Sc. degree and over 25 percent with B.Sc. degree. The corresponding figures in 1977/78 are 10, 61, and 25. Thus, the quality of the scientific staff has improved marginally over time represented, in the upward movement of higher skilled scientists in 1990.

Quality improvement in the scientific staff is recorded in all the individual institutes except BLRI and SRTI. In BLRI and SRTI, percentages of scientists having Ph.D. and M.Sc. degrees have declined in 1990 from 1977/78.

Operational Efficiency

Operational efficiency of the scientists depends on several factors, one being is the size of research budgets, which has been less than satisfactory. In 1988, research expenditures as percentage of agricultural GDP was 0.29. The most conservative norm in this regard is 0.5 percent recommended by the UN World Food Conference (1974). The norms set by FAO and the World Bank are 1.0 and 2.0 percents respectively. Thus research expenditures of the NARS are much below the conservative norm and nowhere near the optimum norms.

Operational efficiency of the NARS scientists has also been constrained by the lack of adequate incentive to the scientists in respect to promotion, travel/training abroad, etc., and above all to a serious lack of appreciation of scientists at the highest levels of the government. This has been reported to the evaluation team during the different meetings with the scientists in different institutes.

Human Resource Study (1990) substantiates to some extent the above contention in respect to promotion. The scientist's positions, eg., CSO, PSO, SSO and SO in the different institutes show pyramidal structure, starting with CSO at the top and SO at the bottom. For relatively young institutes this should be the case. With age and maturity, institutes should exhibit a larger percentage of scientists at higher positions indicating the breaking up of the pyramidal structure. Larger institutes, like BARI, BRRI, BJRI, have large number of scientists with Ph.D. and M.Sc. degrees. Particularly in these institutes, young scientists complain of limited scope for promotion. The Human Resource Development Survey (1990) reveals that a sizeable number of scientists have been

working in their present positions for over ten years, indicating a lack of opportunity for vertical movement in the promotion system. However, information on length of service in the present position would be more meaningful if degree and position where presented. The second point, inadequate opportunities for travel/training abroad, is covered later in this section. The third point, lack of appreciation of the scientists at the highest levels of the government, is demonstrated out by a glaring example of the planning commission not involving the NARS scientists in the preparation of agricultural research planning of the Fourth, Five Year Plan (1990-95).

In spite of these constraints, it is noteworthy that rates of return to agricultural research in Bangladesh, as in developed and other developing countries, are higher than most alternative government expenditures (Gill 1983; Pray 1979).

6.2 Field Level Positions of Scientists

Excluding the BARC field level scientists, field level scientists in the NARS number 379, representing 31 percent of the total scientists. Since information on sanctioned posts at the field levels and also at the central levels of the NARS are not available in the Human Resources Study (1990) and could not be found in the BARC, proportions of field level positions filled by qualified personnel could not be established. However, data generated by the Human Resource Study shed some light on the qualitative aspect of the field level scientists. These are:

1. At field level in the NARS, scientists are relatively less qualified than at the central level. This is reflected in the lower proportion of scientists having Ph.D and M.Sc. degrees at the field level. When the Ph.D. degree is considered as the measure of quality, the situation is worse at the field level.

2. The above trend is perceptible in all the NARS institutes excepting BINA and FRI, where the number of scientists with Ph.D. and M.Sc. degrees are higher than with B.Sc.

3. There are no scientists with Ph.D. degree at the field levels of SRTI, BJRI, or BFRI.

4. BTRI seems weak, with only two Ph. D. scientists, giving it the important task of providing training.

5. Age profile data of the scientists reveals the predominance of younger people (in the numerical sense) at the field levels with the exceptions of SRDI, BINA and FRI.

6.3 Results of Project Activities

The project under review supports the human resource development of NARS through developing methods to link staff time to research planning, improving the capacity of BARC to care for the needs of training in management of research programmes, reviewing manpower reports and improving personnel management procedures, improving the quality of the NARS personnel through long and short-term training at home and abroad, arranging seminars, workshops, and study tours. As discussed in the review section of this report, some components of Checchi and ISNAR TORs are overlapping in respect of assisting BARC to develop a detailed analysis of the recruitment and promotion systems for the NARS.

ISNAR's works have been discussed in the review section where the Human Resources Study (1990) is covered. The study provides a standardized survey methodology and computerized system for recording, analyzing, and producing reports. The survey will serve as a valuable step in the development of a systematized manpower database. However, the survey does not provide information on the number of sanctioned posts for different positions, the number of scientific support staff important for assessment of human resource development and policy formulation. The tables giving information on the number of years spent by scientists in the present position can be more useful if this information is provided by degree and position information.

Apart from providing suggestions for revision and enhancement of the human resource study survey form, Checchi has been helping develop the NARS human resource development program to increase the realization of its training components. The overseas Ph.D. programme of the NARS personnel has been one of the problematic components of the project. The gap between target and implementation is very large, approximately 50 percent. All 16 available training slots were awarded to individuals, but only eight are training. The reasons of the shortfall is discussed later.

Twenty-nine Ph.D. slots are available in the in-country Ph.D. programe. Although 27 are awarded, only 18 are under training now, falling short of the training target by 38 percent. The in-country Ms. programe has 30 slots, of which 10 people have completed study, and another five are currently training. The shortfall thus to-date comes to 50 percent.

Forty slots have been utilized out of 47 slots in the short-term overseas training program, or 1,354 participants (Appendix-C). The shortfall in this programme is 15 percent. Against 43 slots in the workshop/seminar components, 33 are undertaken in different institutions. The number of staff involved in the programmes are 544 (Appendix-C).

The gap between proposed and utilized manpower training programs is due to several factors. These are:

1. Selection of candidates for degree programmes delayed due to the fact that initial processing of candidates began late and was slow, and secondly, the BARC could not evaluate the candidates for selection earlier because of the delay on the part of the institutes to provide complete bio-data of their candidates.

2. Obtainment of the required Natural Training Council (NTC) clearance for advanced degree training abroad is a time consuming process.

3. The requirement of the English proficiency test (ALIGU) for foreign training and frequent failure of candidates on the test is a big impediment in the implementation of the Ph.D. Programs abroad. In collaboration with the training unit of BARC, Checchi is addressing this issue by helping the candidates improve their English comprehension.

4. The shortfalls of the in-country degree program are mainly due to the absence of a 'rotating fund' through which aid can be quickly and smoothly disbursed.

6.4 Major constraints

Tremendous political pressure exists for selection of certain candidates for foreign Ph.D. and M.S. training. There are also unreasonable delays of paperwork at BARC in approving training and selecting candidates. To be assured of the proper passage of one's file for training approval, a scientist must follow the chain of command within BARC and MOA himself. This is not the most efficient use of scientists' time.

6.4.1 The Human Resource Specialist

One of the tasks of the human resource specialist on ARPII-(S) is to assist BARC in developing a detailed analysis of the recruitment and promotion systems for the NARS. At the time of this internal review (BARC, 1991), Checchi had only held some preliminary discussions on recruitment and promotion. ISNAR has started looking at job descriptions, the annual confidential evaluation forms, and from these exercises, has provided some possible alternatives. In addition, ISNAR has collected data in a survey which might be helpful when analyzed.

7.0 PROJECT MANAGEMENT

There have been some difficulties in the area of project management. Apparently, an initial conflict and subsequent breakdown led to some lack of confidence and communication between Checchi, BARC and USAID, from which the project has never completely recovered. This was compounded by changes in team leaders at Checchi, the EVC at BARC, and frequent changes of leadership and project management at USAID.

Assess the performance of USAID and BARC in overseeing, monitoring, and coordinating the activities under ARPII-(S)

7.1. USAID

a. The ARPII-(S) is probably too comprehensive for most of the current USAID Missions to monitor or oversee effectively. An intimate awareness of the team's activities was not possible, thus many of the TA's and their counterparts felt that USAID was not able to visit sites of action for themselves, and had to depend on second hand reports or quarterly summaries. USAID/Dhaka has a rather full portfolio, so one must account for their current workload, and the fact this Project was written and implemented before most of the current staff arrived.

b. USAID has had very little continuity of supervision of this project due to several changes of Project Managers during the past few years. Criticism has recently abated somewhat as the current Project Officer is concerned, aware, and relates well to the Team and BARC.

c. Overlapping activities were noted in the scope of work of the HRD and SRM scientist's technical assistance, with several points of variance between earlier stated terms of reference and those which appeared in later reports. The best available terms of reference have been placed in Appendix-A.([16])

[16] Despite the fact that the evaluation team leader arrived in Bangladesh in May, the TORs for the consultants were not all received by the team members until early in July. Neither Project Paper contained them; the team finally obtained copies from Checchi, but these are, with the exception of the TOR for the ISNAR SRMS, simply photocopied from an Annex in the BARC internal review report done last year (BARC, 1991). In spite of the team's being directed to "refer to the original TORs in the PP" by the Project Officer, this remains an impossible directive to follow. No copy of the PP given to the evaluation team contains the consultant's TORs. Repeated attempts to obtain them from USAID/Dhaka ended in failure.

d. Many scientists stated that they should have been asked for inputs into the decision about the type of TA and duties to be performed, but indicated that they were not asked by BARC or USAID.

e. Many NARS scientists feel that USAID is unrealistic in its insistence that passing ALIGU scores be required even for non-English speaking training sites, such as China, or countries where British English is spoken, such as India.

f. A rather general complaint about USAID is "over-accountability". This seems to be required for even very small amounts of money. Scientists prefer to have control over individual budgets, over which they could have freedom of use with full accountability.

g. A general complaint about USAID is a tendency to want information from BARC overnight, giving those scientists and administrators insufficient time to arrange for it to be collected and sent.

7.2. BARC

a. Of the scientists interviewed, most felt that many of the BARC headquarters staff were generally unaware of Institute and field site activities because the apex coordinating body seldom visits the field.

b. Communications between BARC and ARI management appears to be adequate but the lack of awareness among the scientists about the existence of some of the newly developed documentation and literature search networks reveals a serious gap in activity monitoring and communication between headquarters and the rest of the NARS.

c. The complaint that many of the ARPII-(S) technical assistants were not as effective in the field as had been hoped, reflects a lack of coordination between BARC, USAID, and the Project regarding roles and expectations. Here again, the scientists felt that their suggestions should have been considered in project planning and preparation.

d. An overdependence on expatriate assistance in document generation is evident when one compares expatriate drafts with BARC released publications. A major objective of a good TA program is to advise and work through the counterpart system to enhance sustainability. There is some concern that the MIS database may not be utilized to its full potential unless considerably more hands-on training is carried out during the remaining life of the project. A good filter to hold up to

the performance of a TA assignment is: did this individual do for the counterpart or unit, or did he/she strengthen the counterpart or unit so that the given task can be carried out in his/her absence?

e. Due to a change in leadership, BARC was unable to participate in the initial round of writing the Agricultural portion of the fourth, Five-year plan. The MOA prepared the initial draft which was reviewed by the Planning Commission and given to the Checchi economist with a request to revise it. He did so and the Planning Commission and USAID asked the Checchi team to revise this revision. They did so in meetings attended by BARC leadership and the EVC, and another draft document was produced by BARC and two Checchi team members for support. This copy of the draft document was circulated to all the BARC MDs and to all ARPII-(S) team members. This draft of the report was next circulated to all the NARS DGs, and their comments were incorporated. After this, the draft was circulated for a final time to the BARD MCs, who approved it, with the document becoming the final Agricultural portion of the fourth Five-year plan.

7.3. BARC-USAID relations

Most persons interacting with the evaluation team believe that the relationship between BARC and USAID could be improved. From the point of view of BARC, using a less abrasive style during interactions and attempting to be less patronizing on the part of USAID representatives would be appreciated. On the other hand, USAID staff would welcome more timely reaction and follow-through on administrative matters by BARC staff. It is obvious to the evaluators that both sides need to work on this relationship.

7.4. Training

a. Some respondents indicated that little project-supported training has trickled down to NARS levels below that of BARC management.

b. Others interviewed spoke of training programs being too short to have the intended impact (e.g., the 1-month training of the communications unit staff), or that sufficient hands-on training in use of computers is still lacking.

c. Finally, some researchers feel that some training programs were conducted by the wrong expert or short-term consultant.

8.0 RESEARCH SYSTEM MANAGEMENT

8.1 Short term: Six months to one year

01. The BARC EVC should be elevated to the rank of Ministerial Secretary so that he would have direct access to the Minister of Agriculture.

02. A National Manpower Development Plan should be developed to help provide guidance for training needs; career outlook; growth and security offerings; insure meaningful job descriptions for all workers; and insure fair treatment of workers of both genders and all ethnicities.

03. BARC and the NARS should develop their own standardized research reporting instruments, through wide involvement by all senior scientists; explain the need for uniform adoption and value to the research system.

04. BARC and the NARS should be more supportive and involved in the development and adoption of an effective Management Information System (MIS), Library and Documentation System, and Personnel and Scientific Manpower Registry.

05. BARC and the NARS should encourage research planning to include biological and social scientists, agribusiness representatives, farmers, extension workers, teachers and allied government agencies to ensure relevance to the national need.

06. Extension should address its new role as the trainer of "dealers in agricultural inputs"; to insure that these new change agent helpers are properly grounded in basic facts and understanding; that they understand environmental concerns, pesticide safety, as well as rates per acre of various inputs.

07. Training flow, as well as paper flow should be improved as soon as possible to help eliminate needless frustration among scientists. Stories of delay, improper assignment, etc., should be investigated for both document review, disposition of trainees, etc.

08. BARC and the NARS should institute Five-year external reviews as soon as possible.

09. BARC and the NARS should reward outstanding ARIs and scientists as a result of these reviews.

10. Marketing should be given much greater attention in the future if the FSR approach is to help farmers improve their income potential. Market preparations, market entry, market functions, simple business skills and how to access market information will be needed.

11. BARC should prepare more of its own planning, monitoring, and evaluating documents with less dependence on expatriate assistance.

12. The Socioeconomic Network should be encouraged and strengthened to help insure relevance in research programs, development of strategy and multidisciplinary involvement.

13. The information delivery system of agriculture in Bangladesh should be "opened up" to the new needs of holistic market-oriented farming. The new trends in this effort by the DG of the DAE should be commended.

14. BARC and the NARS should examine their mix of long range (basic), medium and short range (applied) research programs to determine the best fit to their strategic plans.

15. BARC and USAID officials should make serious efforts to attend pertinent research farmer field days and demonstrations to increase their awareness and to show appreciation and concern for the research programs being supported.

8.2 Mid-Term: By June 1993

01. The GOB should make concerted efforts to encourage the new government to place all major agricultural elements (crops, livestock, fisheries and forestry) under one effective MOA.

02. Personnel evaluation mechanisms should be NARS developed, which help to insure objective assessment of performance and other contributions to the institution.

03. BARC and the NARS should develop a uniform recruitment and promotion position to be presented to the new government as an alternative to the current Civil Service system, to ensure that members of this creative research force are measured by a yardstick unique to their needs.

04. Research scientists should be given freedom of lateral and upward movement between positions within the NARS by establishing open competition mechanisms.

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05. Regional Agricultural Research Stations should be made more attractive salary-wise; given more freedom in program and personnel development; more involvement with the local and regional needs (with less program dictated from headquarters stations); and made less isolated by installation of more effective communication linkages.

06. BARC and the NARS should encourage multidisciplinary planning, implementation and reporting to insure the most effective use of resources, most comprehensive consideration of environmentally, socioeconomic, as well as production aspects.

07. The narrow track training of BAU has been opened up to help provide more holistic training for its graduates, but more emphasis needs to be added to prepare students for possible employment in private industry, commercial farming and problem solving skills.

08. Shelf technology should be prepared to help small holders understand post harvest losses and how to minimize them, how to turn surplus products into value, and how to use scheduling as a tool to optimize profit from an enterprise.

09. Wherever possible, USAID and the NARS should encourage project budgets from which the researcher can draw down without going through many layers. This adult treatment would encourage accountability and productivity.

10. BARC should form a distinguished scientist advisory board to help advise the nation on science and technology.

11. BARC and the NARS should enhance communication, sharing of expertise, methodology and information between ARIs in Bangladesh, through joint seminars, planning and informal conferences between scientists and departments.

8.3 Long-Term: Beyond June 1993

01. A well organized list of constraints for each agricultural commodity should be generated and kept current and as a ready reference for planning and prioritizing research at all levels. (Diffuse information on constraints is available, but should be organized and made more readily accessible to users; see FSR recommendation section for a similar recommendation at the local level).

02. BARC and the NARS should engage in a continual "program of enlightenment" for the MPs of the new government to insure their understanding and appreciation of research and related activities in national development.

03. Research scientists should be given the freedom to earn supplemental funding through competitive grants, contact research and consulting.

04. The NARS wants BARC Member Directors (MDs) to serve more leadership functions and also wants involvement in the selection of the MDs; BARC should give this strong sentiment serious consideration. Rotation of senior scientists from the ARIs into BARC, and rotation of the some of the MDs back to the ARIs, merits consideration.

05. BARC and the NARS should make a serious effort to upgrade the leadership skills of its top and middle managers to insure that they are aware and trained in current information networking, planning, priority setting, and are adequately trained to train others.

06. Research scientists should be given special appreciation and privileges for being a valued creative resource to the nation when they create and provide worthwhile contributions.

07. BARC and the NARS should engage in more active public relations and publicity roles to reflect the great contribution agriculture makes to the well being of Bangladesh in normal, as well as post disaster periods.

08. Regional Technical Committees, in which Regional Agricultural Research Station scientists participate, should include agribusiness representatives, farmers, extension agents, teachers and allied government workers in their program planning efforts.

09. BARC will probably not have fiscal or program control over the ARIs, therefore, it should accentuate its value as a service center for planning, information sources, training, and as a point of international linkage.

10. Major commercial benefactors of agriculture and agricultural research should be encouraged to support research with funds, guidance, and involvement to insure that a portion of the research agenda is user-driven.

9.0 CORE DISCIPLINE DEVELOPMENT

9.1 Short Term: Six Months to One Year

01. BARC and the NARS should strengthen relationships with IARCs (especially ICRISAT, ICARDA, ICRAF, ILCA and ILRAD) to ensure more effective access to developed technologies and improved germ plasm.

02. ISNAR and BARC should have the research prioritization expert return to complete the macro priority setting process with a revised approach in tandem with the appropriate BARC staff member.

03. More resources should be made available for AVRDC to train additional BARI staff in vegetables.

04. The ARPII-(S) and BARC should invite back the livestock feed consultant to finish the study he started.

9.2 Mid-Term: By June 1993

01. BARC and Checchi should agree to have either a long-term or a short-term consultant examine science and technology policy issues. Possible research might include (1) evaluating the impact of research conducted by the NARS, i.e., show institutes how to calculate returns to their research and technology transfer activities; (2) examine the impact of policies to liberalize import of inputs; (3) study changes in the seed policy; (4) analyze alternative sources of funding for the research system.

02. The ISNAR program should be continued. The main task should be to encourage the institutionalization of the MIS, strategic planning, priority setting and other techniques. Major effort should be put into the promotion and recruitment study.

03. The human resource specialist should examine promotion systems such as BIDS, the Universities, and the private sector, and should look at systems for promoting scientists in other countries which have successful government research systems.

04. The human resource specialist and the senior research management specialist should sort out their overlapping TORs with regard to promotions and recruitment.

05. Greater support should be provided to FRI for non-degree training in Southeast Asia.

9.3 Long Term: Beyond June 1993

01. Bangladesh should find innovative ways to make the current sources of technology more efficient, while pursuing new ways to finance the research and training necessary to continue improving productivity of the agricultural sector.

02. Research institutes should also conduct research on the relationship between more intensive agriculture and the environment.

03. The goal of future USAID projects should be to increase the availability of appropriate agricultural technology and policy ideas from three sources: imports from outside Bangladesh, applied research conducted in Bangladesh and basic research in Bangladesh.

04. The use of biotechnology methods appropriate to Bangladesh should be encouraged.

05. Changes in science and technology policy are needed to encourage private technology transfer and research.

06. Bangladesh should induce more private research by more effective protection of intellectual property rights through better enforcement of patents and passage of plant breeders rights[17].

07. Private sector research should be given more encouragement and incentives for private research, including a small fund to enable progressive "leader" farmers to host extension agent and researcher trainings (e.g., reimbursement for transport and food costs).

08. Donors should encourage private funding for research activity through matching grants from NGOs or private companies that wish to finance agricultural, livestock, forestry, environmental research at public sector institutes.

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[17]. It does not seem likely the plant breeders rights would have much impact on plant breeding other than to encourage foreign companies that the general business climate in Bangladesh is more favorable to the private sector than it has been in the past. The major crops such as rice and wheat are too easy for farmers to duplicate for plant breeders rights to allow companies to make enough money to finance a research program on these crops. In the U.S. which has had PBRs for 20 years almost all of the wheat and rice breeding is conducted by the private sector.

09. Bangladeshi research institutions should attempt to recover partial costs from farm and research products.

10. BARC and the NARS should strengthen the natural resource management program with more focus on risk management aspects of agricultural production.

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10.0 FARMING SYSTEMS RESEARCH DEVELOPMENT AND TECHNOLOGY TRANSFER LINKAGES

10.1 Short Term: Six Months to One Year

01. a. Recommendation: BARC and ARPII-(S) should host an annual Bangladesh Workshop of FSR practitioners with the following three objectives:

1. Report results of the past year,

2. Discuss work plans for next year, and

3. Agree upon methodological innovations or changes.

b. Background: This should be an inter-ARI event, with the first two venues at BRRI and BARI, then at SRTI, BJRI, BINA, BFRI, FRI and BLRI. Interested major Bangladeshi universities and NGOs should be sought out for either active or passive participation. A proceedings, to include several invited papers and all of the relevant discussion (including full sets of proposed work plans by ARI, university and/or NGO), should be produced and reproduced for all attendees and in sufficient quantity to be sent to all appropriately-interested donors and international institutions.

02. a. Recommendation: During 1991-92, the internal FSR workshop should feature presentations from all relevant ARI's on a summary of their particular FSR approach (objectives, procedures, clientele, AEZs, etc.), with the goal of having participants define a Bangladeshi FSR approach which is acceptable to all.

b. Background: It is not necessary that all ARI's agree on an exact approach. However, it is necessary that they reach agreement on

1. methods and timing of collaboration with one another,

2. exchange of both improved germplasm and promising farming systems patterns, and

3. involvement of extension staff in farm trials.

03. a. Recommendation: FSR field staff should meet and develop short impact assessment templates.

b. Background: The pattern specificity of some ongoing research and technology transfer activities may dictate the development of more than one form. However, the main data which need to be collected are (a) farmers or households adopting the technology without further support from the implementing institution (adoption rate), (b) neighbors and/or relatives adopting the technology under the same conditions (the spread effect), (c) farmers and households favorable reactions to technologies not yet fully adopted or transferred, and (d) unfavorable reactions to the same technologies. Once developed, this same set of impact templates can be used (or modified slightly for use) to systematically capture farmer and household reaction to improved technology at both the multi-locational testing sites and during farmer field days at any FSR site or in response to any trial type.

04. a. Recommendation: The IRRI outreach advisor should assist the ARPII FSR group leader in entering the specifics of at least the 50 "filtered" FSR technologies into the software program, Farm Action.

b. Background: This data entry process should be completed before the end of FY 1991. Copies of this database and the program files should then be made available to each collaborating ARI under BARC, as well as to the major Bangladeshi Universities (BAU, CU, CU, and RU) and NGOs working in the area of agricultural development.

05. a. Recommendation: A hands-on training should be carried out on the use of the Farm Action program, involving at least one technical scientist (with some computer background) from each ARI under BARC.

b. Background: Separate trainings may be needed for the university and NGO contacts. At the end of such a training course, the technical scientist should be demonstrably capable of (1) entering crop/livestock/homestead enterprise data, (2) using such data in a way meaningful to his or her institution, and (3) synthesizing, retrieving and printing out such data.

06. a. Recommendation: The following recommendations are possible addenda to the future implementation of the HVPP. They are not mutually exclusive, and more than one can be tried.

1) Modification of present HVPP farmer training.

a) Re-stress the importance and techniques of seed production and collection of appropriate vegetables during HVPP trainings.

b) Ignore the seed production and collection aspects of the HVPP during the initial farmer trainings. Instead, schedule follow-up trainings solely to cover the importance and methods of vegetable seed production and collection. This can be done at the OFRD level, using the same method for assembling cooperating farmers as was used initially (local trainings and reimbursing farmers' use of rickshaw transport).

2) Involvement of the extension staff.

a) Provide each extension agent with one or two extra seed and fertilizer packets for each of the three main seasons of the HVPP.

b) Each extension agent should then sow his or her own HVPP (or HVPPs), allowing the majority of the plants in this HVPP to go to seed each season.

c) Seeds collected by the extension agent from such plots can be packaged and either sold at cost to collaborating farm households to supplement their collection of seeds, by providing additional seeds of vegetables they were unsuccessful in saving.

3) Development of a sustainable strategy for recovery from natural disaster.

a) Extension could either (1) collect seeds from the extension agents in unaffected areas of Bangladesh for re-distribution to participant farmers in affected areas through the extension agents working there, or (2) grow out the equivalent to 10-20 packets of seeds in a central or regional location which is seldom affected by natural disasters, and collect and save the seed for the eventuality of a natural disaster.

b) Perhaps the northwestern region could be considered as a suitable host region for such a fallback disaster relief seed production strategy.

07. Recommendation: The Bangladesh Sugarcane and Food Industries Corporation (BSFIC) should continue to assist SRTI to continue to develop new varieties and improved technologies, in the form of Cess contributions and field facilities.

08. Recommendation: Both inside and outside the sugar mill zones, the DAE should assist with the dissemination of the STP planting system with the help of the BSFIC and SRTI.

10.2 Mid-Term: By June 1993

01. a. Recommendation: Farmer priorities should be institutionalized into the annual FSR planning processes.

b. Background: The development of agreed-upon methods and criteria (including weights, if necessary) would allow such a planning system to be adapted to unique Bangladeshi conditions and to be put into place across all ARIs involved in FSR. Since extension activities can also be prioritized using the same list of farmer-ranked problems, the DAE should be encouraged to be a joint participant in this exercise.. (A brief model of such an exercise is presented as Appendix E-5).

02. a. Recommendation: Coordination of the FSR approach should be streamlined to make farmer-responsive research effective and quicker.

b. Background: When an activity, research plan, or idea must move up the current MOA command chain -- from farmers to BSs to UAOs to the District technical Committee to the Regional Technical Committee to the appropriate ARI headquarters to BARC to the Permanent Secretary of Agriculture and back down again through these same layers -- both the time lag and the change of content are too great. In addition, the current T&V extension system itself is a top-down approach. With the exception of certain localities, there is little active collaboration between FSR teams and DAE representatives. Without the active involvement of extension in the applied research activities being carried out at FSR sites, extension of such technologies must await this slow process.

03. The NARS should work with the AIS of the MOA to produce and provide information appropriate for farmers on the mature technologies; the BARC TTMU should do likewise for the regional and local extension staff.

04. a. Recommendation: The OFRD should generate short policy-impact papers based on farm-level production and household data.

b. Background: This series of papers should show policy makers (a) the impact of the FSR approach and (b) policy impediments to additional progress in agricultural development. Both BARI and BRRI are working actively in this area. The BRRI Adaptive Research Division uses a RRA method of obtaining farmer response to new varieties which may be more appropriate for other ARIs to follow in order to convince upper-level

ministry officials and MPs of the value of investment in research.

05. a. Recommendation: FSR scientists should synthesize the most useful aspects of the various FSR approaches in use in Bangladesh into a revised "Methodology Guidelines of FSR Manual".

b. Background: The on-farm approach of BRRI, the direct research-farmer training of SRTI and the BARI OFRD methodology and RRA Manual all have proven, valuable elements for future systems research. A new emphasis on client-driven prioritization by systematically and institutionally including research and extension solutions to ranked farmer problems in annual work plans should be outlined in the revised manual.

06. a. Recommendation: The ARIs should agree to a field-level training effort for the DAE SMSs, SMOs, and BSs, in order to achieve a more rapid multiplier effect for promising technology.

b. Background: The evaluators believe that such a field-level training should be patterned after the training method now in use in the Adaptive Research Division of BRRI.

07. a. Recommendation: Extension should be encouraged to become more involved in immediate transfer of verified technologies to other farm households operating under similar socio-economic conditions in the same AEZ.

b. Background: There is no need to wait for verified technologies to emerge from BARC as mature technologies. Regional and district extension leadership should promote early entry into FSR sites and projects. A list of mature technologies, and the companion extension materials developed to assist extension extend them, are primarily developed for extension staff who are located in areas which are not contiguous with the FSR sites and therefore may not be aware of such technologies.

08. Recommendation: Side by side at the FSR sites, the DAE should organize FSR homestead activities in farmers households, collaborating with the TTMU of BARC and, at the local level, with the BARI OFRD.

09. Recommendation: A field-oriented IPM specialist should be brought in, either in a full-time position (to end of contract) or through a series of short-term, recurrent TDYs, to assist ARI entomologists, pathologists and weed scientists to implement the following suggestions, proposed by the IPM specialist and endorsed by this review team:

a. Bangladesh Plant Protection staff should take seriously their primary client -- the farmer, his/her system, and its pest problems -- and assist the FSR

approach scientists to document these problems and arrive at acceptable management solutions to them when economic thresholds are crossed.

b. NARS plant protection scientists should assist the DAE develop and implement an IPM curriculum to use in training at the designated DAE IPM training institute.

c. BARC should use the Plant Protection Wing of the DAE for training in IPM issues.

d. The IPM ARI research effort should be linked closer to the DAE Plant Protection Wing through the SMSs and SMOs stationed in the District and Upazila levels who have been trained in plant protection.

e. BARC should encourage local FSR teams to consult university faculties with specialties in the pest management sciences.

f. Institute, through the systematic problem identification process using both appropriate FSR and DAE staff, a response to pest management problems which arise any time that farmers are polled for their most severe problems.

10.3 Long Term: Beyond June 1993

01. a. Recommendation: Researchers from ARIs should stay a maximum of three to five years at any FSR site.

b. Background: FSR sites are not permanent "mini-stations", but rather nodes for the applied research-technology transfer interface. As such, agreement on a procedure to move from such sites is needed. At the end of each major season, evaluation of progress and its impediments should be identified, ranked, verified with farmers, and factored into next year's work plans. Beginning with year two, simple impact assessment template forms can be used to assess adoption by both primary clients (collaborator farmers) and secondary clients (neighbors and relatives). Rather than continuous testing and fine-tuning of cropping patterns in these sites, progress should be honestly assessed, and frank acknowledgement of constraints (biological, economic, social or cultural) should lead to changes which are verified with farmer collaborators before being incorporated into annual work plans. By no later than year five, a site should be completely in the hands of DAE staff and the farmers, and the ARI FSR team should have shifted operations to a new FSR Upazila.

02. a. Recommendation: BARC should develop a revised set of job performance criteria for rewarding effective research and extension in Bangladesh to help overcome the under-compensation found in farmer's field work.[18]

b. Background: Within this revised set of criteria, a short list of positive incentives is needed to reward field- and household-oriented work in posts remote to Dhaka. (The precedence for such incentives is the Bangladeshi Engineer's Technical Allowance.) Such a short list of positive incentives can be placed on a floating scale which gives the highest incentives for (1) isolation and distance from Dhaka, and (2) proportion of time spent actively working with farmers or rural women and children.

03. a. Recommendation: Care should be exercised in the use of the RRA tool of socio-economic research, just as care is needed in the use of other agricultural research tools.

b. Background: While an RRA result can be used to formulate some types of policy recommendations, it cannot normally be used to recommend policies involving finance, subsidies, or other normal quantitative economic parameters. This is because only reliably-kept, systematic farm record books, maintained for at least one full year, are appropriate to work out the intricate relationships between farm-level supply and demand (input-output) relationships. Even detailed, formal questionnaires are the inappropriate tool for this use. There is one simple reason for this: farmers, the world over, never receive enough for their products and always pay too much for their inputs. Obtaining such types of information through the interview process -- informal or formal -- is more misleading than helpful when extrapolated to the policy arena.

[18] For example, the MOA Daily Allowance is TK 69 (U.S.$1.86 at a rate of TK 37=U.S.$1.00). A room in a government guest house costs the field scientist TK 16 (U.S.$0.43), leaving him with TK 53 (U.S.$1.43) for all food and incidentals per day. It is little wonder so many of the Bangladeshi scientists encountered at regional and local posts are either new, acting, or looking to get a post in Dhaka.

11.0 HUMAN RESOURCE DEVELOPMENT

11.1 Short Term: Six Months to One Year

01. USAID and BARC should establish what is called a "rotating fund" for quicker and smoother disbursement of the taka component of aid.

02. Training programs should be more demonstration-oriented so as to enable the NARS personnel to get training through the "learning by doing" method.

03. Selection of candidates for higher degree training should be done as early as possible. For candidates who would need to take the ALIGU or TOEFL exams, the TTMU of BARC should establish English learning courses, or monitor progress of such courses taken by candidates elsewhere, for the above purpose.

04. Selection for degree training should be based on prioritized needs as determined by the project's manpower needs assessment.

05. For the central in general, but particularly for the regional stations, scientists should be provided with more technical, logistical, and transportation support.

06. USAID should expedite the granting of training waivers, if required by USAID, for candidates accepted into appropriate training courses offered only in countries other than Bangladesh or the U.S.

07. Selection of candidates for higher degree training should be made more rigorous to prevent any default on the part of the candidates.

08. Some measurement scale of English proficiency, perhaps both the ALIGU and TOEFL exams, along with the last date of testing, should become a part of the BARC Personnel MIS database records.

09. The human resource study done by BARC-ISNAR should also include information on:

a. the number of sanctioned posts available for different positions, by research institute; and

b. length of GOB service by both academic degrees and positions held.

10. Where GOB money is not involved, all restrictions on foreign training and travel should be lifted.

11. The ALIGU requirement for English comprehension should be applied on a case-by-case basis, and its necessity depend on the location of training.

11.2 **Mid-Term: By June 1993**

01. Planning commission of the GOB should ensure involvement and participation of the NARS scientists in the planning process of agricultural research.

02. Like human resource study, BARC should institute a unified procedure for recording and monitoring budget allocations and expenditures for the NARS. This should contain, among others, information on sources of funds, e.g., external and internal, breakdowns of funds into capital expenditure, recurrent salary and operating expenditures, etc.

03. More scientists be made available for research in pulses and livestock; more physical facilities be made available for livestock.

04. NARS institutes should have a common clause in each of their Ordinances allowing for lateral and upward mobility of professional staff between institutes; each institute should also have a common promotion system.

05. Attention should be given to place more qualified scientists at the field level.

USAID/Dhaka requested the evaluation team to consider the composition of the contractor team in light of how best it could served project needs from June 1991 to June 1993. In an effort to quantify our opinion, each team member was polled to respond to these three questions:

1. Rank the specialties in the order you feel would best serve ARPII (Supplement from June 1991 to June 1993 within the expected confines of funding.

2. What changes, if any, would you suggest in the current TORs of the specialties selected to best serve the remainder of the project?

3. What program thrusts do you feel USAID should make in the next 5 to 10 years to be of greatest help to Bangladesh agricultural development (excluding those specifically listed in the recommendations)?

Question 1. The results of the poll of the evaluation team members showed a rather consistent range of opinions in response to this question. Most felt that six or seven specialists could cover the program period with supplemental short-term consulting assistance. The average weighted rankings and arrays of opinions given by the team members, in random order follow.

Table 8. Team Member Evaluation results.

Specialty	Weighted Frequency Rating	Individual Team Member Ranking				
		A	B	C	D	E
FSR	1	3	4	2	1	1
Chief of Party	2	4	2	1	3	2
Aquaculture	3	2	1	5	2	3
Vegetables	4	1	3	6	4	5
Research Management	5	5	5	4	5	4
Livestock	6					
Communication	7	6	6	7	8	6
Economics*	8	-	-	3	7	6
Research Facilities Support	9	7	7	6	6	7
Support Services	10					

* One team member suggested the economist should assist BARC/NARS in examining national policy for science and technology; another team member saw this role as one of providing social science balance to the team, especially at the local (FSR) approach level; a third team member viewed this area as appropriate for urgent assistance in marketing issues. This may imply both a long-term specialist and a recurrent series of short term consultancies.

Feedback from the research staff at the research centers indicated a strong need to continue the support of a research facilities support specialist. The previous specialist initiated a program of maintenance and repair training that was beginning to show positive

changes in the research function. Without a strong maintenance program, field research programs could be compromised.

Another issue often discussed is the consideration of hiring an "efficiency expert" industrial engineer who would analyze the size and function of some of the larger Bangladesh research centers advising on ways to improve institutional efficiency. Industries do the periodically to maintain effective cost benefit relationships. Agricultural Research Systems facing declining budgets might find advice from an objective assessment useful.

Question 2.

A. Chief of Party. Between the evaluation team members, it was almost unanimous that the role of Chief of Party be modified to one stressing agribusiness facilitation to give some new direction to the FSR approaches. This will assist them in making the gradual transition from a subsistence to a small commercial emphasis.[19] Guidance is needed for these approaches on (1) how to prepare the marketing channels for small lots of produce/fish/livestock products (i.e., a wide product array), (2) how to define and identify market windows, (3) how to develop the rudiments of an understanding of minimum product quality standards and, perhaps most importantly, (4) how to share simple business skills (basic cost/income/profit accounting) with collaborating farmers.

B. Vegetable specialist. All members of the evaluation team felt strongly that increased support is needed for the vegetable specialist, as this position is newly filled and will soon be inundated with requests for training and FSR site visits, as well as experiment station needs. The team recommends that support be given this expert, in the form of two or more M.Sc. level, full-time field technical assistants, if this potentially overwhelming task is expected to be realized during the next two years.

C. Aquaculture specialist. The evaluation team has determined that the already highly productive aquaculture program needs more local assistants to continue with the breakthrough begun during the past two years, and to increase its spread effect. Changes in the BAU curriculum to intensify the training of BSs in the DAE may be years away to be of much assistance in the next two years in the area of fisheries knowledge. High priority should be given to multiplying the impact of the aquaculture program by arranging provision of more assistants.

[19] Once a smallholder has put together a fish-poultry pond and added vegetable and fruit trees, there will be a surplus which can be sold. This is then the foundation of a grass roots sustainable enterprise.

D. Research management specialist. This TOR should be more directed into operationalizing those tools developed over the past two years. More emphasis should be placed on involving both top-level, and mid-management, positions at BARC and all ARIs in learning how to use the MIS data to better support and manage the NARS. If necessary, the evaluation team urges these hands-on trainings take top priority in this TOR and, also if necessary, assistance for the current resident specialist be arranged if this is too big a task for one professional to undertake. The evaluation team cannot place too much stress on the recent history of MISs being put into place and becoming almost instant dinosaurs -- relics covered with the dust of disuse -- because not enough hands-on training in their use occurred following their installation.

Question 3. This question has been covered in detail both in the body of the report and in the preceding recommendations sections (sections III.-V.), but the evaluation team agrees that one theme remains as to how USAID can assist most in the area of smallholder enterprise development in Bangladesh. Farm leaders express their uniform concern and utter frustration with available commercial credit sources. Their fledgling farm businesses are in jeopardy because of a lack of venture (or seed) capital. For these reasons, the team wonders what mechanisms could be developed to make more low interest loans available to this extremely small but highly motivated group of agribusiness entrepreneurs. USAID may not be the appropriate source of starter capital, but it may be able to influence other donors -- including the commercial banking sector in Bangladesh -- to see this urgent need. The young agribusiness entrepreneurs are not asking for give away funds, but they cannot move forward very fast with the current credit restrictions facing them in Bangladesh.

11.3 Long Term: Beyond June 1993

01. The research budget of the NARS should be progressively increased, because it is presently much below the conservative norm recommended by the UN World Food Conference (1974) and nowhere near the level suggested by FAO and the World Bank.

02. Donors' contribution to agricultural research expenditure, which was a little more than 25% of the total in 1988, should be at least maintained in view of the fact that rates of return to agricultural research are higher than most alternative opportunities for government expenditures.

03. BAU, which provides the basic education to most of the NARS scientists, should have a curriculum with more of a problem-solving orientation.

APPENDIX A
Scope of Work

APPENDIX A, Section 1

SCOPE OF WORK
AGRICULTURAL RESEARCH PHASE II
(ARP-II) (338-0051) PROGRESS EVALUATION

1. ACTIVITY IDENTIFICATION:

The activity to be evaluated is the Agricultural Research Phase II Project (ARP-II) supplement. The task is to carry out an evaluation of progress towards achievement of project purpose.

2. PURPOSE OF THE EVALUATION:

- To enable USAID and the BDG to assess the progress and examine the results of the project to date in relation to project purpose and planned project outputs.

- To provide USAID and the BDG with an assessment of the performance of the project contractors in implementing the activities as defined by their contract Terms of Reference.

- To provide USAID and the BDG to identify those short-term and medium-term changes to project strategy, areas of focus and implementation activities which are essential to the improvement of project performance.

- To assist USAID in considering longer-term directions and options in relation to its support of agricultural research.

THE MOST IMPORTANT INTENDED USE OF THE EVALUATION FINDINGS AND RECOMMENDATIONS IS TO PROVIDE THE BASIS FOR, AND GUIDE DECISION-MAKING AND PLANNING WITH RESPECT TO FUTURE AREAS OF STRATEGIC FOCUS AND IMPLEMENTATION.

4. STATEMENT OF WORK:

4.A The evaluation shall examine project performance in the following areas:

4.A.1 RESEARCH SYSTEM MANAGEMENT:

ASSESS THE EFFECTIVENESS OF THE ARPII PROJECT ACTIVITIES IN STRENGTHENING BARC'S CAPABILITY TO MANAGE. PLAN AND PRIORITIZE AGRICULTURAL RESEARCH.

To include the following areas of investigation (and, in addition, specifically address the performance of BARC management support activities under the Checchi and ISNAR contracts in relation to contract terms of reference):

1) BARC's input to improving national agricultural research planning (i.e. the National Agricultural Research Plan, the Fourth Five-Year Plan. Institutes Five year Master Plans and Annual Plans).

2) Priority-setting and establishment of review process/procedures for research plans and proposals.

3) Establishment of operational systems for research monitoring and evaluation.

4) Implementation of key accepted evaluation recommendations.

5) Information services and communication of research findings.

4.A.2 CORE DISCIPLINE DEVELOPMENT:

EXAMINE 1) WHETHER/HOW REGIONAL PLANNING AND MANAGEMENT OF CORE DISCIPLINE RESEARCH HAS IMPROVED AND 2) RESULTS OF RESEARCH IN DEVELOPING APPROPRIATE AND ACCEPTABLE NEW TECHNOLOGIES.

To include the following areas of investigation (and specifically address the performance of core discipline development activities carried out under the Checchi. IRRI, ICLARM contracts and DWRC PASA in relation to terms of reference):

1) Actual research results-technologies developed at regional research stations in those core areas in which ARPII provides specialized support. i.e livestock,

fisheries, pest management and vertebrate pest control (including technologies relevant to women's role in agricultural productions).

2) Outputs of core research in developing improved crop varieties and crop production practices.

3) Effectiveness of socioeconomic component in ensuring relevance of core research to farmer's (men and women) needs and economic viability.

4) Adequacy of support services- i.e., station management, facility and equipment procurement and maintenance and inventory management.

4.A.3 FARMING SYSTEMS RESEARCH DEVELOPMENT:

ASSESS 1) WHETHER, THROUGH BARC, THE RESEARCH INSTITUTES ARE EFFECTIVELY CO-ORDINATING AND INTEGRATING THEIR ACTIVITIES AT FSR SITES AND 2) RESULTS OF FSR IN DEVELOPING PROVEN TECHNOLOGIES FOR TRANSFER TO FARMERS.

To include the following areas of investigation (and specifically address the performance of FSR development support activities carried out under the Checchi, IRRI, and ICLARM contracts and DWRC PASA in relation to terms of reference):

1) Outputs of FSR- number and type of proven technologies and technology packages developed for transfer (eg., crop varieties, cropping patterns, livestock, fisheries, agroforestry and resource use and post-production technologies).

2) Effectiveness of commodity support provided to FSR by ARPII commodity and FSR specialists.

3) Efficiency of allocation of ARPII resources to selected FSR sites.

4) Performance of ARPII in assisting BARC co-ordinate FSR at the national level.

5) Performance of FSR in involving women in research and in conducting research relevant to women's present and potential areas of production and post-production activity.

6) Effectiveness of integration of socioeconomic component in ensuring appropriateness of FSR activities for client needs.

4.A.4 FARMING SYSTEMS-TECHNOLOGY TRANSFER LINKAGES:

(Note: Although technology transfer was not explicitly defined to be one of the original planned project outputs, the final impact of the project in contributing to increased food production will depend on the acceptability and adoption of developed technologies by farmers. Therefore it is important to determine whether the appropriate mechanisms are in place to effectively transfer technologies).

ASSESS WHETHER THE APPROPRIATE TRANSFER MECHANISMS ARE IN PLACE AND OPERATING TO EXTEND THE TECHNOLOGIES DEVELOPED BY PROJECT-SUPPORTED RESEARCH.

To include the following areas of investigation:

1) Actual exchange of information between farmers, extension workers and researchers in planning and assessing FSR results.

2) Type and number of technologies tested through farmer field days and on multi-location testing sites.

3) Actual extension packages developed and tested under pilot production programs.

4) Existing availability and coverage of various technology transfer mechanisms, including technology transfer activities by the private sector.

4.A.5 HUMAN RESOURCE DEVELOPMENT:

ASSESS PROJECT PERFORMANCE IN ENSURING THAT QUALIFIED AND APPROPRIATELY-TRAINED PEOPLE ARE IN PLACE TO CONDUCT AGRICULTURAL RESEARCH.

To include the following areas of investigation (and specifically address the performance of human resource development activities carried out under the Checchi and ISNAR contracts in relation to terms of reference).

1) Quality of manpower survey and manpower needs assessment.

2) Proportion of field-level positions filled by qualified personnel.

3) Results of project-supported in-country, and in-service non-degree and degree training activities of men and women.

4) Results of project-supported overseas training of men and women.

4.A.6 PROJECT MANAGEMENT:

ASSESS THE PERFORMANCE OF USAID AND BARC IN OVERSEEING, MONITORING AND CO-ORDINATING THE ACTIVITIES UNDER THE ARPII PROJECT.

4.B Based on 1) the detailed findings and conclusions of the evaluation team with respect to project performance in each of the above areas, and 2) consideration of the overall context, needs and opportunities with respect to agricultural research in Bangladesh, the contractor shall develop:

4.B.1 A SET OF RECOMMENDED NECESSARY ACTIONS, WITH PRIORITIES, FOR USAID, BARC, AND THE CONTRACTORS, TO IMPROVE THE SHORT-RUN PERFORMANCE OF THE PROJECT-I.E. INDICATE WHAT SIGNIFICANT CHANGES SHOULD BE UNDERTAKEN IN THE NEXT SIX MONTHS TO ONE YEAR TO STRENGTHEN THE EFFICIENCY/EFFECTIVENESS OF PROJECT IMPLEMENTATION.

4.B.2 A SET OF RECOMMENDATIONS, WITH PRIORITIES, FOR USAID AND BARC, TO IMPROVE THE EFFECTIVENESS OF THE PROJECT IN THE MEDIUM-TERM-BY JUNE 1993- I.E. INDICATE THOSE SIGNIFICANT CHANGES IN STRATEGY, AREAS OF FOCUS OR EMPHASIS, MIX OF ACTIVITIES AND IMPLEMENTATION METHODS WHICH WOULD STRENGTHEN PROJECT PERFORMANCE IN RELATION TO PLANNED OUTPUTS AND PURPOSE.

4.B.3 A SET OF STRATEGIC OPTIONS FOR THE LONGER-TERM-BEYOND JUNE 1993- I.E. SUGGEST ALTERNATIVE APPROACHES, CONSISTENT WITH THE DIRECTIONS OF THE COUNTRY DEVELOPMENT STRATEGY STATEMENT (CDSS), FOR MAXIMIZING THE POTENTIAL BENEFITS OF FUTURE INVESTMENTS IN ACQUISITION OF TECHNOLOGY TO SUPPORT SUSTAINED ECONOMIC GROWTH IN THE AGRICULTURE SECTOR.

8. REPORTING REQUIREMENTS:

8.A Report Format: Written Report shall contain the following sections:

8.A.1 Executive Summary: Approximately 5 pages, single-spaced.

8.A.2 Statement of Findings, Conclusions and Recommendations: Findings and Conclusions should be short and succinct, with the topic identified

by a short sub-heading related to the areas of investigation identified in the statement of work. Recommendations shall correspond to the major findings, shall be prioritized, and specify who or which agency should take the recommended action. Recommendations shall be provided for the short-term and for the medium-term (as described in the statement of work). Recommendations for the longer-term shall include provision of a set of longer-term strategic options.

8.A.3 Body of the Report: The report should provide the evidence and analysis to support the findings and conclusions. It should not exceed 80 pages, single-spaced, in length.

8.A.4 Appendices: These are to include at least the following:

1) The Evaluation Scope of Work

2) A description of the methodology used to obtain and analyze the information.

3) Selective tabular presentations of quantitative empirical information.

4) Presentation. if applicable, of technology case histories.

5) Selective presentation of supplementary qualitative information.

6) A bibliography of documents consulted.

7) A list of persons/agency representatives interviewed.

8.A.5 Completed sections of the A.I.D. Evaluation Summary: H: Evaluation Abstract, and J: summary of Findings, M; Conclusions and Recommendations.

8.B Submission of Report:

The evaluation team shall submit a work plan on Day 4. A report outline (i.e. table of contents) shall be provided to USAID and BARC approximately two weeks after the beginning of evaluation activity. Ten copies of the first draft report shall be provided to USAID and BARC for comment o/a June 30, 1991. Ten copies of a draft complete report shall be submitted to USAID and BARC for comment prior to the completion of in-country work on July 10, 1991. Thirty copies of the final report shall be provided to USAID and BARC on or before July 31, 1991.

8.C Team Meetings and Debriefings:

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8.C.1 The Deputy Director, Office of Food and Agriculture (OFA), will arrange a briefing meeting on Day 1 to include the evaluation team, the Director, OFA, the Deputy Director, OFA, the Director, Program Office, the Deputy Director, Program Office, the Project Officer. OFA the Evaluation Officer, and Program Specialists, OFA. The purpose of this meeting will be to brief the team with respect to the ARPII Project, its relationship to the overall country strategy, its purposes, key components and activities and to discuss key evaluation issues, concerns and needs.

8.C.2 The evaluation team shall meet on Day 1 with the Executive Vice-Chairman of BARC, Member-Director for Planning and Evaluation, and other BDG officials. The purpose of this meeting will be to conduct a host-country briefing for the evaluation team with respect to the ARPII project and to discuss key host-country evaluation issues, concerns and needs.

8.C.3 The evaluation team shall also meet briefly on weekly basis with the Director, OFA, the Deputy Director, OFA, the Program Specialists and the Evaluation Officer to report on the progress of the evaluation.

8.C.4 Two formal evaluation team debriefings shall be conducted, one with USAID Management and staff and one with BDG officials, to be arranged on suitable dates during week of July 7, 1991.

APPENDIX A, Section 2

TERMS OF REFERENCE FOR TECHNICAL ASSISTANCE, ARPII-S

Chief of Party/Team Leader Dr. Joseph J.C. Madamba

Terms of Reference

1. Overall supervision of the work of the other Resident Specialists and Short-term Consultants and ensure the fullest utilization of their expertise.

2. Suggest changes in procedures and substantive areas for project attention not considered in the initial project supplement design with sufficient justifications for such changes and expected results based on experience.

3. Prepare the annual work plan and financial plans based on the recommendations of the work and financial plans submitted by other Resident Specialists.

4. Provide Quarterly Progress Reports to USAID and BARC on the Progress achieved under the Project.

Human Resources Development Specialist

Terms of Reference

1. Assist BARC in developing and updating the National Research Manpower Plan and maintain a current computer record of existing agricultural research personnel.

2. Assist the Chief of Party with personnel management staff development procedures to improve incentives, morale and performance of scientists administrators and support staff.

3. Assess the qualifications of in-country and out-of country training candidates to ensure they are sufficiently qualified and that they are available for training in a timely manner.

4. Strengthen the research-extension linkage by developing various teacher-learning situations with farmer participation and aimed at improving food production, nutrition and family income.

5. Develop in-country and overseas training, technical competence, management and communications skills that will strengthen the thrust of farming systems research in Bangladesh.

6. Assist BARC in developing a detailed analysis of the recruitment and promotion system for the NARS and in improving the recruitment and promotion procedures, the relationships between the Bangladesh Civil Services cadres and the non-cadred Class 1 officers, the use of the seniority system for assignments and promotions and the intricacies of the Establishment Ministry assignment system.

PHASE II (Supplement)

Communication Specialist **Mr. K.D. Swann**

Terms of Reference

The Terms of Reference call for the Communications Specialist to provide technical assistance to the BARC and related institutes in the following twelve areas:

a) Advise key officials on the most effective way to communicate desired information and communication products and on the content of these products as they relate to reaching their intended audiences.

b) Promote improved understanding and increased support for agricultural research in Bangladesh by decision makers.

c) Plan, design and develop programs which will provide printed information and audio-visual materials, and continue the expansion of scientific libraries and documentation services.

d) Promote and continue to improve the interchange of research and other relevant information among agricultural scientists and extension personnel of Bangladesh.

e) Assist in providing effective library and documentation services to support the research of agricultural scientists of Bangladesh.

f) Encourage closer working relationships and better understanding among the various individuals and component institutions of the agricultural research community in Bangladesh.

g) Plan, produce and disseminate an informal periodic newsletter to all administrators and scientists of BARC and other institutions in the National Agricultural Research Systems (NARS).

h) Work with the Farming Systems Research Team Coordinator and other specialists for the FSR Team to plan produce breakthroughs, etc. in farming systems research in Bangladesh.

i) Encourage the improvement of agricultural research publications in Bangladesh including the annual report of BARC.

j) Assist BARC to conduct selected symposia for the NARS during FYs 88-91.

k) Train appropriate personnel in BARC and participating institutions in agricultural communications/library science.

l) Prepare annual work and financial plans in collaboration with the Executive Vice-Chairman and Head of the Agricultural Information Center.

Economist/Social Science Specialist Dr. Ali Muhammad

Terms of Reference

1. The Economist/Social Science Specialist will be located at BARI, but will work directly with the National Agricultural Research System assisting the NARS on economic analysis of farming systems in the dry and rainfed agroclimatic areas and on practices adapted to these physical and socioeconomic conditions. He/she will be expected to interact closely with scientists at NARS Institutes, especially the agronomists, animal scientists and economists, and with economists from other institutes involved in farming systems research. With assistance and guidance from the Coordinator of the Field Specialist Team, he/she will support the Coordinator of the National Farming Systems Research Program in organizing and implementing their respective schemes as appropriate. The Specialist will be expected to spend at least 50 percent of his/her time in the field designing, monitoring and evaluating FSR research.

2. Be responsible for assisting and coordinating with the Planning and Monitoring Specialist, the Implementation of a data collection, monitoring and evaluation system for the ARP-II(S) in order to clearly demonstrate and measure the socioeconomic impact of the project on the NARS, the extension services and on farmers and the rural landless.

3. Measure the appropriateness and effectiveness of technologies developed for farmers. This includes the measurable effects of technologies developed by the NARS Institutes, Regional Research Stations and Farming Systems Research Sites. The specialist will review and evaluate improved varieties, cropping patterns and agricultural technologies that have proven feasible and been adopted by local farmers and measure increases/decreases in resources productivity and household income.

4. Assist the NARS Research Institute to increase their capacity to conduct relevant socioeconomic research at the farming systems research sites and to facilitate the delivery of research results to farmers and extension personnel.

5. Assist the NARS Research Institute to assess the impact of research Investment and Improving the agricultural productivity and income generation of rural households, including women, e.g., innovative new opportunities for productivity, improved access to training opportunities and improved interaction between field station and farming system research site staff, rural women and extension workers working with rural women.

6. Together with the Monitoring and Evaluation Specialist and his/her counterparts, document cases of feedback about successful research and applications of the research, including cases of research partially or fully supported by the ARP-II(S) which led to adoption of improved technologies by farmers resulting in increased productivity, increased food output, and/or increased farmer income.

7. Assist in training staff for multi-disciplinary research programs by participating in the development and implementation of in-country and overseas programs and assist in the selection of candidate for overseas and in-country training.

8. Continue assistance to the central socioeconomic data center.

9. Assist in the analysis of national policy issues related to appropriate technology, employment, role of women and family selections of tasks and benefits.

10. Advise and assist the homestead production research group, within the On-farm Research Division at BARI. In conducting research trials and training focusing on increasing the agricultural productivity of rural women. Where appropriate, recommend short-term technical assistance to assist with this activity.

11. Assist the other members of the Field Specialist Team in analyzing and reviewing pertinent data from the farming system research sites and recommend modifications/adjustment/etc.

12. Prepare annual work and financial plans in collaboration with host country counterparts, the Field Team Coordinator and Chief of Party.

Farming System Research Specialist Dr. R.N. Mallick

Terms of Reference

1. Coordinate and lead a five member team of discipline specific scientists who will be stationed at Research Institutes and Stations. The specialist will be expected to spend at least 50 percent of his/her time in the field designing, monitoring and evaluating FSR activities.

2. Assist BARI and other Research Institutes plan, implement and supervise farming system research in Bangladesh in both farmers fields and experimental stations.

3. Assist BARI to coordinate and direct farming systems research of multidisciplinary teams at the different participating agricultural research institutes.

4. Assist BARI to organize in-country workshops, conferences and seminars with assistance from the other BARI staff and Field Specialist Team members.

5. Assist BARI to identify key findings in farming systems research and communicate them to Department of Extension (DAE) personnel and other agencies for accelerated implementation by farmers.

6. Coordinate with USAID in effectively implementing a project data collection, monitoring and evaluation system which will continuously monitor and evaluate the farming systems research program, particularly relative to the adoption of the generated technology by farmers and the impact on production.

7. Advise and assist the Homestead Production Research Group, within the non-farm Research Division at BARI, in conducting research trials and training focusing on

increasing the agricultural productivity of rural women. Where appropriate, recommend short-term technical assistance to assist with this activity.

8. Prepare annual work and financial plans in collaboration with the Member-Directors, the National Coordinator for Farming Systems Research and the Chief of Party.

9. Ensure that each of the Field Specialist Team member is spending at least 50 percent of his/her time travelling to and working on the farming systems research sites in Bangladesh. Keep fully abreast of their activities and outputs.

Integrated Pest Management Specialist Dr. E.D. Magallona

Terms of Reference

1. The Integrated Pest Management Specialist will work directly with the BARI, assist the Director General and his staff in planning and implementing the IPN component of the NFSRP in Bangladesh. The Specialist will be expected to spend at least 50 percent of his/her time in the field working with the Regional and Sub-station staff designing, monitoring and evaluating farming systems research activities.

2. Prepare a listing of pests and diseases affecting each group.

3. Technology package from pre-planting to harvest.

4. Develop the linkage between On-Farm Research Division and the Plant Protection Divisions to encourage plant protection research which can be conducted at FSR sites.

5. Designing, monitoring and evaluating SFR activities.

6. Assistance in planning the creation/establishment of Specialized Laboratories/Activities.

7. Encouragement of research in gaps to complete IPM package.

   a. Develop methodologies for pest surveillance or crop loss assessments under controlled conditions.
   b. With assistance from the Communication Specialist and Field Coordinator, arrange several national conferences/workshops on Integrated Pest

Management.

c. Assist in identifying and evaluating candidates for long and short term training to the US and other third world countries as appropriate.

d. Promote, coordinate and/or participate in the organization of long-term and short-term training for agricultural research scientists and extension workers as appropriate.

8. Develop a program for local foreign training, study workshops, etc.

a. Promote, encourage and assist in the dissemination of training materials, manuals, brochures and audio-visuals to extension workers and farmers.

b. Prepare a listing of crops which should be given IPM field guide writing program.

c. Prepare detailed outline of field guide for sugarcane in consultation with Member-Director (Crops) and SRTI scientists.

9. Develop a program to extend relevant research findings to regional trials in cultivators holdings as a coordinated effort among research and extension staff.

10. Working closely with the Coordinator of the Field Specialist Team and other members of the Team, recommended specific research ideas/technologies that could be incorporated into the farming systems research program.

11. Assist BARI, BARC, and BARI and respective Station and Sub-stations to prepare their research project proposals and experiments on Integrated Pest Management.

Livestock Production Specialist **Dr. J.J. Madamba**

Terms of Reference

1. Coordinate with the BARC, BIRI and the Ministry of Livestock and Fisheries in identifying problems, determining priorities and developing long term and short terms strategies and programs on livestock research, within the framework of the National Farming Systems Research Program.

2. Working with host country counterparts and short terms consultants and coordinating with other donors/banks involved in the livestock sector, develop and design a scope of work for a comprehensive epidemiological study to identify the economic importance of the various diseases and parasites affecting the livestock sector, as well as evaluating the cost effectiveness of presently available controls.

3. Working with host country counterparts and coordinating with other donors/banks involved in the livestock sector, develop and design scopes of work for a series of comprehensive studies of the present animal health service delivery system, the nutritive value of locally available foodstuffs and the current manpower problem faced by sector.

4. Based on the results of these comprehensive studies, assist the farming systems research network develop the appropriate technologies to include: increasing the animal feed resource base, improving support services for improved livestock management and breeding for stock improvement.

5. Recommend measures for implementing short term and long term programs on livestock research, especially farming systems in Bangladesh (i.e. training and workshops).

6. Assist participating institutions prepare their research project proposals and experiments on improved livestock and forage production technologies.

7. Work closely with the Department of Agricultural Extension (DAE) in disseminating research results to farmers and livestock products.

8. Provide technical guidance to all farming system research sites when requested through the field team coordinator.

9. With assistance from the communication specialist and field team coordinator, arrange one international and two national conferences/workshops on livestock research.

10. Prepare annual work and financial plans in collaboration with counterparts, participating institutes, the Field Team Coordinator and the Chief of Party.

Planning and Evaluation Specialist Dr. Thomas E. Morgan

Terms of Reference

1. Assist in developing a clear mandate for the BARC Planning and Evaluation Division and corresponding revised terms of reference for the Member-Director for Planning and Evaluation and his professional staff.

2. Assist BARC in updating the National Agricultural Research Plan (NARP). Develop

standard procedures oriented to provide adequate information required by the institutes, their associated ministries, BARC and Planning Commission.

3. Develop a standardized format/methodology for preparation of National Agricultural Research Proposals. Institute Five-Year Master Plans and Annual Plans.

4. Train BARC and Research Institute personnel in research planning methodology.

5. Develop and maintain a computerized data base needed for planning and determination of research priorities. This includes developing a comprehensive (but not excessively complicated) classification of research linked to staff and budget).

6. Assist the Planning and Evaluation Division to develop and maintain a reference facility for planning documents.

7. Assist BARC and USAID in developing a monitoring and evaluation system for the ARP-II(S).

Research Facilities Specialist Dr. Lous T. Palmer
Terms of Reference

	TOR	ACTION COMPLETED/STATUS
1.	Develop Inventory of NARS Equipment	
2.	Assist in procurement of the following: - vehicles - laboratory equipment - computers - books - journals - BJRI spares ($20,000) - tractor rehabilitation ($25,000) - photography lab. equipment ($35,000) - ultra-centrifuge BARI Ent. ($50-110,000) - lab equipment BAU Genetic ($25,000)	4. 5. 6.
3.	Assist in the Training in-country of the following skills groups: - tractor operators - basic mechanics - advanced mechanics - workshop supervisors I - auto mechanics - welders - power tiller mechanics I - power tiller mechanics II - field station managers - laboratory equipment repair - advanced tractor mechanics - workshop supervisors' II - workshop supervisors' II	 7.

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4. Assist in selection for training abroad (UK)
   - workshop supervisors'

5. Provide guidance to help improve field stations, building/ irrigation/land development

6. Assist in PL-480 budgeting

7. Assist in selection of new stations

Senior Research System Management Specialist Dr. Robert E. Witters

Terms of Reference

1. a. Assess the management information needs of the BARC and assist in the design and implementation of a management information system. This will include an analysis of existing program and financial information flows, the identification of the type and form of information required at different levels in BARC, the design of new procedures to generate the required information, and the implementation of the improved system.

   b. Review BARC's existing financial management system and determine if it effectively supports the national agricultural research system mandate. This will include an assessment of the present financial planning and expenditure system, a determination of the time required by Research Institutes, Stations and sub-stations, to comply with the present system, the identification of required changes outside BARC's control and the development of background material for BARC presentation to the Ministry of Agriculture, other ministries and donors to effect these changes.

2. Review present personnel policies of NARS with the view to improving the selection, distribution, support and incentives for staff within the national agricultural research system.

3. Analyze the BARC Strategic Plan and review the program monitoring and evaluation system and assist in the implementation steps to improve the quality and effectiveness of research and the appropriate allocations of resources to priority research problems.

4. Assist BARC colleagues in examining BARC's present position as 'coordinator' of agricultural research in Bangladesh with respect to staff and funding levels.

5. Review the national agricultural research system facility management issues with Research Institute Director General, Station and Sub-station Managers and assist appropriate system staff in preparing improved station development, maintenance, operations and personnel strategies as well as a system for monitoring and evaluating progress in these terms.

Aquaculture Specialist **Dr. M.V. Gupta**

Terms of Reference

1. Review FAO/BGD 20 year (1985-2005) National Fishery Development Plan and recommend support for selected components of research and training to BARC, FRI and USAID.

2. Working closely with Coordinator of Field Specialist Team and other members of the Team, recommend specific research ideas/technologies that could be incorporated into the farming systems research programs.

3. Identify potential pilot sites to carry out rice-cum-fish culture, cage/pen culture or other appropriate production technologies and work with FRI scientists and farmers at their sites.

4. Recommend measures for implementation short-term and long-term programs on fisheries research, specially as these relate to farming systems in Bangladesh (i.e. training and workshops).

5. Assist FRI to prepare their research project proposals and experiments on fisheries.

6. Work closely with Dept. of Agricultural Extension in disseminating research results to farmers and fishermen and livestock producers.

7. Provide technical guidance to all FSR sites when requested through Field Team Coordinator.

8. With assistance from Communication Specialist and Team Coordinator, arrange one national and one international conference/workshop on inland fisheries research.

9. Prepare annual and financial workplans in collaboration with counterparts from BARC/FRI and Field Coordinator.

Senior Horticulturist **Dr. M.L. Chadha**

Terms of Reference

The Specialist will:

Interact closely with scientists at the BARI Regional Agricultural Research Stations (BARI/RARS), including participating in the national coordinated farming systems research program and will assist BARI/RARS scientists in organizing and implementing their program schedules, as appropriate.

Assist in coordinating a linkage between the Asian Vegetable Research and Development Center (AVRDC) and BARI. He/she will assist AVRDC and BARI scientists in developing and introducing new varieties of vegetables into Bangladesh and support and assist BARI scientists in research methodologies and training.

Develop in collaboration with the Department of Extension (DAE), intensive vegetable/fruit production systems on a year round basis with particular emphasis on the efficient use of homestead plots and family labor;

Determine manpower and training needs in vegetable/fruit research and in the selection of personnel necessary for the vegetable/fruit research program;

Work closely and maintain direct linkages between the BARI/Horticulture Division and the BARI On-Farm Research Division.

Work closely with the Field Team Coordinator and other members of the FSR Team, report and recommend techniques, cultural practices, etc. that will benefit the farming systems research program and rural families; and

Prepare annual and financial work plans in collaboration with counterparts participating institutes, Team Leader and the Chief of Party.

APPENDIX B

EVALUATION METHODOLOGY

The program of the evaluation team consisted of attending briefing meetings held at (1) BARC with the Executive Vice-Chairman (EVC), BARC with Member Directors of all Divisions and Department Heads, BARC with SMRS, Aquaculture, and Horticulture specialists, (2) USAID with the Director and Deputy Director of Food and Agriculture Wing, and (3) Steel House with Checchi specialists.

The program included visits to different Agricultural Research Institutes (ARIs) located in or near Dhaka, namely BRRI, BARI, BJRI, and BLRI. The team also visited the Bangladesh Forest Research Institute (BFRI) at Chittagong, and the Fisheries Research Institute (FRI) and the Bangladesh Institute of Nuclear Agriculture (BINA) at Mymensingh, and the Sugarcane Research and Training Institute (SRTI) at Ishurdi, Pabna. The team members held discussions with the Directors of these ARIs, key scientists and other appropriate staff members.

During visits to laboratories, greenhouses and fields, current experiments and trials were seen and discussed. In addition, research scientists of the various ARIs, and regional agricultural research scientists at Hathazari, Chittagong; Ishurdi, Pabna, and Rajshahi research station made formal presentations and presented hard copies of data to describe their work and results.

On many occasions, the evaluation team split into smaller working groups of one to three members in order to meet individual scientists once introductory presentations by the Heads of ARIs were completed. These more detailed meetings allowed the evaluation team to get a better picture of management and other aspects of institutional capability. Later on, the team members shared views and experiences.

During mid-June, the evaluation team broke into three working groups, with one group concentrating on report initiation in Dhaka, a second spending some days travelling to and conducting interviews with farmers and farm groups in Sylhet, and the third travelling to and conducting interviews with researchers and farmers in Rajshahi and Ishurdi (after being joined by the second group). The second group used a simple form to record responses of regional and local scientists in a "mini-RRA."

The team also met eminent personalities, like the Permanent Secretary of Agriculture, the Member (agriculture) Planning Commission, the Director General of the DAE, and the Vice-Chancellor of Bangladesh Agricultural University (BAU). The team spoke with these gentlemen to determine their views regarding the accomplishments of different

components of agricultural research through the ARPII (Supplement).

The evaluation team also visited selected FSR sites and discussed programs with farmers to apprise themselves of farmer's reactions to the FSR approaches and recommended technologies. Team members also solicited responses from participant farmers to see how they liked or disliked the technology.

Finally, the evaluation team reviewed a huge volume of literature relating to the project: more than 180 publications and documents. This literature included, among other things, annual and quarterly reports (from ARIs and the ARPII (S) team), technical papers and reports, and proposals for special research projects.

APPENDIX B
Evaluation Methodology

APPENDIX C
Tables of Quantitative Information Relevant to ARP-II Training Activities

Section 1.	An Abstract on Training Programs Under ARP-II (Supplement)/CCCI Project.
Section 2.	Statement on "Participant Training" Under ARP-II (Supplement) as of 31, May 1991.
Section 2a.	Status Report on Overseas Ph.D. Scholarship awarded candidates under the ARP-II (Supplement) Project as of 30 June 1991.
Section 2b.	Status Report on Ph.D. Scholarship Awarded (In-country) candidates under the ARP-II (Supplement) Project as of 30 June 1991.
Section 2c.	Status Report on M.Sc. Scholarship Awarded (in-country) candidates under the ARP-II (Supplement) Project as of 30 June 1991.
Section 2d.	Status Report on Non-degree Participant Training awarded candidates under the ARP-II (Supplement) Project as of 30 June 1991.
Section 3.	In-Country Short-Term Training Courses/Workshops/Seminars (as of 31 March 1991).
Section 4.	List of Fisheries Training Programs Conducted Under Agricultural Research Project-II (Supplement).

APPENDIX C, Section 1

AN ABSTRACT ON TRAINING PROGRAMS UNDER ARP-II (SUPPLEMENT)/CCCI PROJECT 1988-1991

A. Approved Training Programs under USAID ARP-II (Supplement) Project

1. Degree Program

1.1	Ph.D. (Foreign)	16
1.2	Ph.D. (Local)	29
		45

2. Degree Program

2.1	M.Sc (Local)	30
2.2	M.Sc (Foreign)	Nil
		30

3. Short-term Training

3.1	Overseas	47 Slots
3.2	Local	-

B. Program implemented/under implementation up to 30 June 1991

1. Implementation of Degree Program

1.1 Ph.D. (Overseas)
- * On-going 9
- * With admission confirmed 4
- * Without admission 3

1.2 Ph.D. (In-country)
- * On-going 23
- * Not yet admitted 2
- * Not yet selected 4

1.3 M.Sc (Local)

* Completed 10
* On-going 10
* Not yet admitted 2
* Not yet selected 8

1. Short Term Training (Implemented)

1.1 Short Tour/Seminar/Workshop etc. under USAID ARP-II (Supplemented)

Overseas

27 Utilized
8 Under process

1.2 Local Training

* Under 33 Training Programs locally undertaken in different institutions 1349 personnel were trained

ARP-II (Supplement)/CCCI Specialists were involved in imparting training to the participants.

APPENDIX C, Section 2

STATEMENT ON "PARTICIPANT TRAINING" UNDER ARP-II (SUPPLEMENT) AS OF 31 MAY 1991

Name of Trainee	Type of Trainee	Venue of Time
1. Nadira Begum, BARI	Seminar	India (Dec'88)
2. Dilruba Ahmed, BARI	Seminar	India (Dec'88)
3. Samad Talukder, BARC	USDA-Graduate Program	USA (Dec'88)
4. Md. Qumrul Islam, BARC	Short-term training	India (Jan'89)
5. Dr. Jahangir Kabir, BARC	Attending Agriculture	India (Feb'89)
6. Abdul Waheed Khan	Training on Project Planning for agriculture and rural development	USA (April'89)
7. Mrs. Ishrat Jahan Ministry of Agriculture	Training on Project Planning for agriculture and rural development.	USA (May'89)
8. Dr. Md. Nurul Islam	Int. Conference on Sweet Potato Management	USA (June'89)
9. Md. Rafique Mostafa Kamal, BARC	Database Software	AIT, Bangkok (July'89)
10. Mrs. Khurshida Khandaker, BARC	Training, Certificate program	USA (Aug'89)
11. Mr. Mahbub Ahmed, BARC	Short term training on Computer program	USA (Aug'89)
12. Mr. A.K. Motiur Rahman, BARI	Ph.D. Degree	UPLB, Philippines (June'90)
13. Ms. Nurun Nahar, BARI	Ph.D. Degree	UPLB, Philippines (June'90)
14. Saidul Borhan RARS/Ishurdi	Training on Tractor repair, etc.	UK (Aug'90)
15. Mr. Md. Abdullah, BARI	Training on Tractor repair, etc.	UK (Aug'90)
16. Dr. Z.Karim, BARI	"Seminar on Impact of Global Climatic Changes"	USA (June'90)
17. Dr.Md. Azhar Hossain, BAU	Food Symposium	USA (Aug'90)

18. Dr.Md. Sultan Hossain Dhaka University	Int. Seminar on Soil Correlation	USA (Oct'90)
19. Dr. S.M. Shaheed, SRDI	Int. Seminar of Soil Correlation	USA (Oct'90)
20. Dr. S.M. Monowar Hossain, BARI	10th Annual Association Farming Systems Research and Extension	USA (Oct'90)
21. Ms. Daulatunnessa Chowdhury, BARI	10th Annual Association Farming Systems Research and Extension	USA (Oct'90)
22. Dr. A.K.M. Amjad Hossain, BARI	3rd Int. Mango Symposium	Australia (Sep'89)
23. Md. Al-Amin, BARI	3rd Int. Mango Symposium	Australia (Sep'89)
24. Mr. Ahmed Hussain, BARC	Study Tour of Indian Agricultural Research Institutes	India (Sep'89)
25. Mr. A.F.M. Mosharraf Hossain, Ministry of Agriculture	Study Tour of Indian Agriculture Research Institutes	India (Sep'89)
26. Mr. Matiur Rahman, BARI	Study Tour of Indian Agriculture Research Institutes	India (Sep'89)
27. Mr. Azhar Hossain Mozumder, FRI Philippines	Ph.D. Degree	UPLB, (Dec'89)
28. Mr. Samar Kanti Bose, FRI State	Ph.D. Degree	Syracuse University, USA (Dec'89)
29. Ms. Suraiya Yasmin, BARI Philippines	Ph.D. Degree	UPLB (Apr'90)
30. Mr. Syed Shamsuzzaman, BARI	Ph.D. Degree	UPLB, Philippines (Apr'90)
31. Mr. Firoz Alam, BARI	Ph.D. Degree	UPLB, Philippines (Jun'90)
32. Mr. Motiur Rahman Howlader, BLRI	Ph.D. Degree	UPLB, Philippines (June'90)
33. Mr. Wais Kabir, BARC	Ph.D. Degree	UPLB, Philippines (Jun'90)
34. Dr. Lutfor Rahman Khan, BAU	International Conference on Ground Water Resource Management	AIT, Bangkok (Nov'90)
35. Dr. Nizamuddin Ahmed, BARI	Asian Farming System Working Group Meeting and Symposium	Bangkok (Nov'90)

36. Dr. S.N.H. Arangzeb, BARC	Asian Farming System Research and Extension Workshop and visit to Research Development sites	Bangkok and Philippines, (Nov'90)
37. Dr.M.A. Hamid Miah, BARC	Asian Farming System Research and Extension Workshop and visit to Research Development sites	Bangkok and Phlippines (Nov'90)
38. Dr. Mirza A. Jalil, BARC	Asian Farming System Research and Extension Workshop and visit to Research Development sites	Bangkok and Philippines (Nov'90)
39. Md. Shariur Rahman, SRTI LKO/INDIA	Research to inspect moist hot air treatment of cane cuttings.	Indian Institute of Sugarcane (Nov'90)
40. Md. Salimullah Khan, SRTI	To inspect two moist hot air treatment (MHAT) plants and to visit "Agricultural Engineering and Pathology Division" of Indian Institute of Sugarcane Research.	LKO/India (Nov'90)
41. Mr. Fazlul Hoq, BARI	"Int. Symposium on Farming System"	Bangkok (Nov'90)
42. Mr. Mainur Rahman, BARI	"Int. Symposium on Farming System"	Bangkok (Nov'90)
43. Prof. Shamsul Haq, BLRI	"Int. Conference on Farming System Research and Visit to Research Institute in Indonesia"	Thailand/Indonesia (Nov'90)
44. Dr. Muhammed Hussain	International Food Engineering Conference	Bangkok (Dec'90)
45. Prof. Muhammed Hossain, BAU	78th Indian Science Congress	India (Jan'91)
46. Dr. Amirul Islam Dhaka University	78th Indian Science Congress	India (Jan'91)

APPENDIX C, Section 2a

Status Report on Overseas Ph.D. Scholarship awarded Candidates Under the ARP-II (Supplement) Project as of 30 June 1991

Name	Position/Place of Employment	Course/Program/Institution	Country of Study	Duration of Ph.D./Ms. Training Program	Man-month utilized as of to date	Remarks
I. Ph.D. Scholarship awarded candidate (In Training)						
1. Samar Kanti Bose	Jr. Res. Officer BFRI, Chittagong	Ph.D. Program in Pulp & Paper Science at SUNY	USA	Jan '90 to Dec '92 (36 months)	18.5	On-going
2. Mr. Azhural Hassan Mazundar	Jr. Res. Officer, BFRI, Chittagong	Ph.D. Program in Forestry Soils and SUNY	USA	Jan '90 to Dec'92 (36 months)	18.5	On-going
3. Mr. Syed Sansuzzaman	SO, OFRD, ARI, Kishorganj	Ph.D. Program in Farming Systems at UPLB	Philippines	Apr '90 to Oct '93 (42 months)	15.5	On-going
4. Mrs. Suriya Yasmin	SSO Statistics, BARI	Ph.D. Programs in Agricultural Statistics at UPLB	Philippines	Apr '90 to Oct '93 (42 months)	7.0	Returned in October, 1990 and withdrew from scholarship for personal reasons.
5. Mrs. Nurun Nahar	SO, BLRI, Savar, Dhaka	Ph.D. Program in Animal Production (including Embryo transfer) at UPLB	Philippines	Jun '90 to Oct '93 (40 months)	5.0	-Ditto-
6. Mr. Katiar Rahman Howlader	SO, BLRI, Savar, Dhaka	Ph.D. Program in Animal Health at UPLB	Philippines	Jun '90 to Oct '93 (40 months)	13.5	On-going
7. Mr. Firoz Alam	SO, Plant Breeding Div. BARI, Joydebpur	Ph.D. Program in Tissue Culture/Molecular Biology/Genetic Engineering at UPLB	Philippines	Jun '90 to Oct '93 (40 months	13.5	On-going
8. Mr. Wais Kabir	SSO, (Ag. Eng. Div.) BARC	Ph.D. Program in Irrigation and Water Management at CLSU	Philippines	Jun '90 to Oct '93 (40 months)	13.5	On-going

9. Mr. A.K.M. Matiar Rahman	SSO, Vegetable Section, BARI, Joydebpur	Ph.D. Program in Fruits & Vegetable Breeding at CLSU	Philippines	Jun '90 to Oct '93 (40 months)	13.5	On-going
10. Mr. Arif-Ul-Alan	Associate Cane Entomologist, SRTI, Ishurdi, Pabna	Ph.D. Program in Biological Control of Insects at UPLB	Philippines	Jun '91 to Oct '94 (40 months)	0.3	On-going
II. Ph.D. Scholarship awarded candidates (with admission)						
1. Mr. Muhammad Zaher	SSO, FRI, Mymensingh	Ph.D. Program in Aquiculture at Orissa University	India	42-man-months	-	Admitted to Ph.D. program at Orissa University, India
2. Mr. Shahab Uddin	SO, FRI, Mymensingh (Fresh Water System)	Ph.D. Program in Brackish water and Marine Fisheries at CMFRI	India	42-man-months	-	Admitted for Ph.D. program at Central Marine Fisheries Research Institute at Cochin, Kerala, India.
3. Mr. M. Moazzen Hossain	SO, (Test Dept.) BJRI, Dhaka	Ph.D. Program in Jute Technology	India	42-man-months	-	Admitted to the University of Leeds, UK. Starting November, 1991
4. Mr. Kanal Uddin	SSO, (Tech. Div.) BJRI, Dhaka	Ph.D. Program in Jute Technology	India	42-man-months	-	Admitted to the University of Leeds, UK. Starting November, 1991
III. Ph.D. Scholarship awarded candidates (without admissions)						
1. Mr. A.K.M. Mortuza Ahmed	SSO, FRI, Mymensingh	Ph.D. Program in Farming Systems (Fisheries)	India	42-man-month	-	Application sent to India but no confirmation received yet; has not yet passed ALIGU test
2. Mr. Rafiqul Islam	Scientific Officer, BLRI, Savar, Dhaka	Ph.D. Program in Farming Systems (Livestock)	Philippines	42-man-month	-	Refused the scholarship

Note: Current man-months utilized as of 30 June 1991 = 118.8.

SUNY = State University of New York (Syracuse).
UPLB = University of the Philippines at Los Banos (Laguna)
CLSU = Central Lugon State University (Nueva Ecija)
CMFRI = Central Marine Fisheries Research Institute (Kerals).

APPENDIX C, Section 2b

Status Report on Ph.D. Scholarship Awarded (In-country) candidates under the ARP-II (Supplement) Project as of 30 June 1991

Sl.No.\Name	Position/Place of Employment	Course/Program	University	Due date of scholar-ship	Expected date of completion	Man-months utilized to date	Remarks
I. Ph.D. Scholarship awarded candidates (In-Training)							
1. Mr. A.B.N. Abul Khair	PSO, BARI	Ph.D. Program in Farming System	BAU	19.09.89	18.09.93	21.5	On-going
2. Mr. Fazle Ali	SO, SRDI	Ph.D. Program in Soil Management	DU	30.12.89	31.12.93	18.0	On-going
3. Mr. Saiful Islas Chowdry	PSO, BINA	Ph.D. Program in Agronomy	BAU	24.09.89	23.09.93	21.3	On-going
4. Mr. Rablul Haque	Asstt. Prof. Agril. College	Ph.D. Program in Agril. Chemistry	BAU	28.09.89	27.09.93	21.0	On-going
5. Mr. Haron ur-Rashid	PSO, Agril. Engg. BARI, Joydebpur	Ph.D. Program in Water Management/Irrigation	BUET	22.10.89	21.10.93	20.3	On-going
6. Mr. Nazim Uddin	SSO, BARI	Ph.D. Program in Fruits & Vegetables	BAU	02.04.90	01.04.94	15.0	On-going
7. Mr. Ataur Rahman	PSO, BINA	Ph.D. Program in Plant Breeding	BAU	04.04.90	03.04.94	15.0	On-going
8. Mr. Khabir Ahmed	SSO, BARC	Ph.D. Program in Aquaculture	DU	27.09.89	26.09.93	21.0	On-going
9. Mr. Safiqul Alan Bhulyan	Asstt. Prof. BAI, Dhaka	Ph.D. Program in Tissue Culture	DU	01.10.89	30.09.93	21.0	On-going

10. Mr. Akhtaruzzaman	SO, FRI, Mynensingh	Ph.D. Program in Brackish water Aquaculture	DU	30.11.90	31.10.94	7.0	On-going
11. Mr. Abu Taher	SSO, BJRI	Ph.D. Program in Statistics	DU	30.11.90	31.10.94	7.0	On-going
12. Mr. Abdul Mannan	SSO, BARI	Ph.D. Program in Fruits and Vegetables	BAU	02.04.90	01.04.94	15.0	On-going
13. Mr. Mahbubur Rahman	SSO, BARI	Ph.D. Program in Farming System	BAU	30.11.90	31.10.94	8.0	On-going
14. Mrs. Nargis Sultana	SO, BJRI	Ph.D. Program in Biological Control of Insects	DU	11.06.90	10.06.94	12.5	On-going
15. Mr. Sharifur Rahman	Head, Plant Pathology, SRTI	Ph.D. Program in Plant Pathology	RU	30.11.90	31.10.94	8.0	On-going
16. Mr. A.K.M. Md. Kabir	Asstt. Quarantine, SRTI	Ph.D. Program in Seed Pathology	BAU	30.11.90	31.10.94	8.0	On-going
17. Mr. Sultana Razia	SSO, BARC	Ph.D. Program in Plant Nutrition	DU	30.11.90	31.10.94	8.0	On-going
18. Miss Hasna Banu Hussain	SO, FRI	Ph.D. Program in Aquaculture	BAU	30.11.90	30.10.94	8.0	On-going
19. Mr. Sayed Abul Khair	SSO, FRI	Ph.D. Program in Brackish Water & Aquaculture	RU	30.11.90	31.10.94	8.0	On-going
20. Mr. Abdul Awal Biswas	Asstt. Prof., PKC	Social Science/Anthropology	DU	17.06.91	16.06.95	0.5	On-going
21. Mrs. Sharifa Jahan	SO, BLRI	Ph.D. Program in Health	BAU	24.04.91	23.04.95	3.5	On-going
II. Ph.D. Scholarship awarded candidates (without admission yet)							
1. Mr. Shahadat Ullah	Professor (Agri.Extn), BAI, Dhaka	Ph.D. Program in Agril. Extn.	-	-	-	-	Not yet admitted

2. Mr. Md. Zahid Hossain	SO, BLRI	Ph.D. Program in Animal Production	-	-	-	-	Not yet processed by the CASR since he has applied recently
3. Mr. Saleh Uddin Ahmed	PSO, FRI	Ph.D. Program in Fisheries	-	-	-	-	Admission under process.

NOTE: Current man-months utilized as of 30 June 1991 = 267.6

APPENDIX C, Section 2c

Status Report on M.Sc. Scholarship Awarded (in-country) candidates under the ARP-II (Supplement) Project as of 30 June 1991

Sl.No./Name	Position/Place of Employment	Course/Program	University	Due date of scholarship	Expected date of completion	Man month utilized to date	Remarks
I. M.Sc. Scholarship awarded candidates							
1. Mr. Wahed ali Pramanik	SO, FRI, Mymensingh	M.Sc. Program in Aquaculture	BAU	25.09.89	24.03.91	16.0	Completed studies
2. Mr. Borhan Uddin	SO, BARI, Joydebpur	M.Sc. Program in Toxicology	BAU	22.10.89	21.04.91	16.0	Completed studies
3. Mr. Biswanath Mitra	SO, BARI, Joydebpur	M.Sc. Program in Plant Breeding	BAU	27.09.89	26.03.91	16.0	Completed studies
4. Mr. Sayeed Quamrul Islas	SO, FRI, Mymensingh	M.Sc. Program in Brackish water	BAU	14.11.89	13.05.91	16.0	Completed studies
5. Mr. Khandaker Anisul Islam	SO, FRI, Mymensingh	M.Sc. Program in Brackish Water	BAU	09.11.89	08.05.91	16.0	Completed studies
6. Mr. Abdul Wahab	SO (Ag. Engg.), BARI	M.Sc. Program in Farm Machinery	BAU	28.12.89	27.06.91	17.8	Completed studies
7. Mr. Shariful Islas	SO (Ag. Engg.), BARI	M.Sc. Program in water Mgt./Irrigation	BUET	06.01.90	05.07.91	17.8	On-going
8. Mr. A.B.M. Golan Rabbani	SO, BJRI, Dhaka	M.Sc. Program in Agronomy	BAU	22.07.91	21.07.91	17.2	On-going
9. Mr. Siddiqur Rahman	SO, BARI, Joydebpur	M.Sc. Program in Farming System	BAU	02.11.91	01.11.91	14.0	On-going

10. Mr. A.K.M. Monirul Haque	Lecturer, Agril. College Dumki	M.Sc. Program in Integrated Plant Nutrition	BAU	24.01.90	23.07.91	17.2	On-going
11. Mr. Salful Hasan	Asstt. Cane Agronomist SRTI, Ishurdi	M.Sc. Program in Farming System	BAU	11.02.90	10.08.91	16.5	On-going
12. Mr. Abdullah	Asst. Cane Entomologist, SRTI	M.Sc. Program in Biol. Control of Insects	-	-	-	-	On-going
13. Mr. Enanul Haque	Lecturer, BAI	Agril. Extension	-	-	-	-	On-going
14. Mr. Md. Moshiur Rahman	Lecturer, PKC	Agronomy	BAU	08.05.91	07.11.92	-	On-going
15. Md. Md. Jasin Uddin	SO, BARI	Horticulture	-	-	-	-	On-going
16. Mr. Sree Kanta Sheel	SSO, BARI	Post Harvest Processing	BAU	16.05.91	15.11.92	-	On-going
17. Mrs. Monota Khandaker	Asstt. Soil Chemist, SRTI	M.Sc. Program in Soil Management	BAU	24.09.89	23.03.91	18.0	Completed studies
18. Mr. Topon Kumar Pal	SO, BARI, Joydebpur	M.Sc. Program in Fruits and Vegetables	IPSA	03.10.89	02.04.91	18.0	Completed studies
19. Mr. Paritosh Kumar	SO, BARI, Joydebpur	M.Sc. Program in Plant Pathology	IPSA	15.09.89	14.03.91	18.0	Completed studies
20. Mr. Shanal Chandra Matha	SO, FRI, Mymensingh	M.Sc. Program in Aquaculture	BAU	15.09.89	14.03.91	18.0	Competed studies
21. Mr. Anser Ali	SO, BARI, Joydebpur	M.Sc. Program in Seed Pathology	-	-	-	-	Not yet admitted
22. Mr. A.K.M. Mohlbur Raham	SO, BARI, Joydebpur	M.Sc. Program in Plant Breeding	-	-	-	-	Not yet admitted

APPENDIX C, Section 2d

Status Report on Non-degree Participant Training awarded candidates under the ARP-II (Supplement) Project as of 30 June 1991

Sl.No./Name of Participant	Position/Place of Employment	Course/Program/Institution	Country of Training/Visit /Workshop	Date of Training	Man-month utilized to date	Remarks
I. Completed Training Opportunities						
1. Mrs. Dilruba Ahmed	SO, BARI, Joydebpur	Intl. Conference on Appropriate Technologies for Farm Women; ICAR	India	30 Nov - 4 Dec 1988	0.17	
2. Miss Nadira Begun	SO, BARI, Joydebpur	-Ditto-	India	30 Nov - 6 Dec 1988	0.23	
3. Mr. Qunrul Islam	Sr. Documentation Officer, BARC, Dhaka	Conference on Documentation and Information; ICRISAT, Hydrabad	India	16 Jan - 20 Jan 1989	0.17	
4. Dr. Jahangir Kabir	Sr. Scientific Editor, BARC, Dhaka	Information, Publication and Documentation Program; PARC, Islamabad	Pakistan	18 Feb - 24 Feb 1989	0.23	
5. Mr. Abdul Waheed Khan	Agricultural Economist, MOA	USDA TC 140-15, Project Planning for Agriculture and Rural Dev. Washington, D.C.	USA	27 Apr - 2 Jun 1989	1.20	
6. Dr. M. Nurul Islan	SSO, Entomology, BARI, Joydebpur	Intl. Conference on Sweet Potato Pest management; Miami, Florida	USA	18 Jun - 23 Jun 1989	0.20	

7. Miss Ishrat Jahan	Research Officer, MOA, Dhaka	USDA TC 140-2, Project Analysis for Agr. and Rural Development Washington, D.C.	USA	31 May - Jul 14 1989	1.53	
8. Mr. M Rafique Mostafa Kamal	Bibliography Officer, AIC, BARC	CDS/ISIS Database Software; AIT	Thailand	18 Jul - 1 Sep 1989	1.50	
9. Dr. M. Mahbubur Rahman	SSO (Entomology), BARI	2nd Intl. Symposium on Bruchids and Legumes; Yokahama, Japan	Japan	6 Aug - 10 Sep 1989	1.17	Airfare borne by symposium organizers
10. Dr. Mrs. Khurshida Khondakar	SSO (Forestry), BARC	Agro-Forestry; University of Florida	USA	6 Aug - 16 Sep 1989	1.40	
11. Mr. Ahmed Hussain	Director of Training, BARC	Study Trip, Administration of Agricultural Colleges	India	12 Sep - 23 Sep 1989	0.40	
12. Mr. Matiur Rahman	Deputy Secretary, MOA	-Ditto-	India	-Ditto-	0.40	
13. A.F.M. Mosharaf Hussain Khan	Principal Education Officer, BARI	-Ditto-	India	-Ditto-	0.40	
14. Dr. A.K.M. Anzad Hossain	CSO/Leader, Mango Program, BARI, Joydebpur	3rd Intl. Mango Symposium, Darwin, Australia	Australia	24 Sep - 29 Sep 1989	0.20	
15. Mr. M. Al-Amin	PSO, BARI, Mango Research Station	-Ditto-	Australia	24 Sep - 29 Sep 1989	0.20	

145.

16. Mr. Mahbub Ahmed	Senior Systems Analyst and Acting Director of Computer Center, BARC	Management Information System (MIS) USDA Graduate School; Washington, D.C.	USA	14 Aug - 8 Dec 1989	3.93	
17. Dr. Abdus Sanad Talukder	Sr. Training Officer, BARC Dhaka	Certificate Program in Human resources Management; USDA Graduate School, Washington D.C.	USA	3 Jan - 15 Dec 1989	11.44	
18. Dr. Zahurul Karia	Member-Director (S&I) BARC	Participation in the Collaborative Study in Impact of Global Climatic Changes on the production of major crops, Washington D.C. & Honolulu	USA	26 Jan - 9 Feb 1990	0.50	
19. Dr. Mohammad Zabar Hossain	Associate Professor, BAU, Mymensingh	Participation in the 2nd Intl. Symposium on Chromosome Engineering at Missouri-Columbia University	USA	13 Aug - 15 Aug 1990	0.10	
20. Mr. M. Abdullah	SOS (Agri. Eng.) BARI, Joydebpur	Short Training on Massey Ferguson Tractor Mechanics	UK	20 Aug - 14 Sep 1990	0.87	
21. Mr. M Saidul Borhan	SSO (Ag.Eng.) RARS, Ishurdi, Pabna	Short-Training of Massey Ferguson Tractor Mechanics	UK	20 Aug - 14 Sep 1990	0.87	
22. Dr. M.S. Hussain	Dhaka University	Intl. Soil Co-relation meeting and Annual Meeting of Amer. Assoc. of Agronomy	USA	7 Oct - 27 Oct 1990	0.75	

23. Dr. S.M. Shaheed	SRDI, Dhaka	-Ditto-	USA	7 Oct - 27 Oct 1990	0.75	
24. Dr. Muhammad Hussain	Dean, Faculty of Agriculture, BAU, Mymensingh	Participation in the Intl. Food Engineering Conference and additional visit to Kasetsart University and AIT.	Thailand	3 Dec - 9 Dec 1990	0.25	
25. Dr. A.K.M. Nuruzzaman	-	Participation at the World Aquaculture '90 Conference	Canada	10 Jun - 14 Jun 1990	0.20	
26. Dr. Monwar Hossain	PSO (Plant Breeding), BARI, Joydebpur	Participation in the 10th Annual Symposium of the Association for Farming System Research Experiment at Michigan State University	USA	14 Oct - 17 Oct 1990	0.13	
27. Mrs. Daulatun Nessa	SSO, BARI	-Ditto-	USA	14 Oct - 17 Oct 1990	0.13	
28. Mr. S.N.H. Arangeb	Member-Director, (Crops), BARC	Participation in 1990 Asian FSR&E Symposium at Bangkok and pertinent study tours in Thailand, Philippines, and Indonesia	Thailand, Philippines & Indonesia	19 Nov - 9 Dec 1990	0.70	
29. Dr. M.A. Hamid	Member-Director (P&E), BARC	-Ditto-	-Ditto-	-Ditto-	0.70	
30. Dr. M.A. Jalil	Member-Director (Livestock), BARC	-Ditto-	-Ditto-	-Ditto	0.70	

31. Prof. Shamsul Haq	Director, BLRI, Savar	-Ditto-	-Ditto-	26 Nov - 9 Dec 1990	0.50	
32. Dr. Nizamuddin Ahmed	PSO, BRRI, Joydebpur	Participation in 1990 Asian FSR and Symposium at Bangkok, Thailand with pertinent in-country study tour	Thailand	13 Nov - 22 Nov 1990	0.33	
33. Mr. Mainur Rahman Siddique	SSO, BRRI, Joydebpur	-Ditto-	Thailand	19 Nov - 26 Nov 1990	0.27	
34. Mr. M. Fazlul Haq	PSO, BARI, Joydebpur	-Ditto-	Thailand	-Ditto-	0.27	
35. Mr. A.H.M. Delwar Hossain	PSO, SRTI, Ishurdi, Pabna	-Ditto-	Thailand	-Ditto-	0.27	
36. Dr. Lutfor Rahman	Associate Professor, BAU, Mymensingh	Participation at the International Conference on Ground Water Resources Management in Thailand	Thailand	4 Nov - 12 Nov 1990	0.27	
37. Mrs. Hasina Begun	Circulation Officer BARC	Iowa State University, Short-term Training in Documentation Circulation System	USA	28 Jun - 31 Aug 1991	0.17	

APPENDIX C, Section 3

In-Country Short-term Training Courses/Workshops/Seminars (as of 31 March 1991)

Almost all ARP-II(S) Team Members were involved in one way or another in the implementation of the following in-country short-term training courses/workshops/seminars (as of 31 March 1991).

	Title	Venue	No. of Trainees/Participants
I.	**Short Term Training Courses**[1]		
	1.1 Applied Statistics	BARI	25
	1.2 Computer Software	BARI	44
	1.3 Survey Techniques	BARI	42
	1.4 Rapid Rural Appraisal (RRA) Training	BJRI/Dhaka RARS/Ishurdi RARS/Jessore RARS/Hathazari RARS/Jamalpur	85
	1.5 Research Planning and Evaluation	BARI	125
	1.6 FSR Methodology	FRI/Mymensingh	20
	1.7 Welder's Training Course	MAWTS	15
	1.8 Tractor Operators	BARI BAU Ishurdi Hathazari	20
	1.9 Basic Mechanics	BARI BAU Ishurdi Hathazari	20
	1.10 Advanced Mechanics	BARI	10

[1] In addition, informal hands-on training was provided on:
- "Equipment Inventory Data Input and Retrieval" (BLRI, BARI, BAU)
- "Use of WordPerfect 5.1 and Harvard Graphics 2.3 Software" (FRI, BJRI)
- "FSR Data Presentation" (FSR sites at Jamalapur, Tangail, Faridpur, Kalampur, Ishurdi, and Jessore).

1.11 Workshop Supervisors Course	BARI	12
1.12 Technical Writing and Editing	Dhaka BARC BARI FRI/Mymensingh	51
1.13 Library/Documentation Computerization	BARC	11
1.14 Workshop Presentation and Computer Inputting	BARC	18
1.15 Software Application	BARC	8
1.16 Writer's Round-table	BARC	9
1.17 Writing for Extension Literature	BJRI/Dhaka BAU/Mymensingh RARS/Hathazari	51
1.18 Publications Officer's Course	BARC	13
1.19 Professional Improvement Course for Writers	BARC	26
1.20 Multi-Media Production and Training Course	BARC	45
1.21 Train the Trainers Course	BARC	11
1.22 Agroforestry Systems Research, Design and Diagnosis	BARI	30
1.23 Homestead Vegetable Production (for Extension Officers)	BARC	91
1.24 Homestead Vegetable Production Training (for Block Supervisors)	RARS/Ishurdi	125
1.25 Homestead Vegetable Training (for Family Planning Volunteers)	Bhaluka, Fultala	327
1.26 Feed Resources Training	BARC	80
1.27 Fisheries Data Analysis	FRI/Mymensingh and Chandpur	40
Subtotal		**1,354**

II.	Workshops/Seminars		
	2.1 Farming Systems Research and Development	BARI	100
	2.2 Seminar on Auto Mechanics	Dhaka	25
	2.3 FSR Annual Workshop Review	BARI	60
	2.4 Seminar on Livestock and Poultry Disease Control	BARC	35
	2.5 Seminar in WID/Post-Harvest and Value-Addition Opportunities	BARC	25
	2.6 Mature Technology Orientation Workshops	Dhaka Jessore Ishurdi	300
		Subtotal	545
		GRAND TOTAL	1,899

APPENDIX C, Section 4

List of Fisheries Training Programs Conducted Under Agricultural Research Project-II (SUPPLEMENT)

Sl. No.	Date of training	Title of Training	No. and persons attended
1.	19.02.90 - 24.02.90	Nursery Pond Management	17 Farmers
2.	21.05.90 - 26.05.90	Aquaculture Technology	12 BRAC Officers
3.	05.06.90 - 06.06.90	Nursery Management of Thai sharputi	29 Farmers
4.	30.6.90	Fish Pond Management	40 Farmers at Ishurdi
5.	11.07.90	Fish Pond Management	35 Farmers at Tangail
6.	22.07.90 - 09.08.90	Fisheries Data Analysis	20 Fisheries Scientists
7.	28.07.90	Tilapia culture	25 Farmers at Tangail
8.	18.08.90 - 03.09.90	Fisheries Data Analysis	20 Fisheries Scientists
9.	06.10.90 - 15.10.90	Farming System Research Methodologies and Aquaculture Technologies	13 FSR Scientists 2 BRAC Officers
10.	21.10.90 - 23.10.90	Orientation Training on fish culture	7 MCC Scientific Officers
11.	11.03.91 - 14.03.91	Aquaculture Technologies	Upazila Fishery Officers - DOF
12.	17.03.91 - 23.03.91	Aquaculture Technologies	Extension Officers - BRAC (18) - Proshika (5) - CARITAS (2)
13.	27.03.91 - 02-04.91	Nursery Pond Management	Nursery operations - BRAC (25) - Gono Kallyan Trust (1) - Unnayan Sangha (2)

14.	03.04.91 - 06.04.91	Aquaculture Technologies	Field Extension Workers - BRAC (25)
15.	07.04.91 - 12.04.91	Nursery Pond Management	Nursery Operators - BRAC (30)
16.	04.05.91 - 07.05.91	Aquaculture Technologies	Field Extension Workers - BRAC (3)

APPENDIX D

Case History: Research Protocol at the Sugarcane Research and Training Institute

APPENDIX D, Section 1

Case History: Research Protocol at the Sugarcane Research and Training Institute

Three members of the evaluation team visited the Sugarcane Research and Training Institute (SRTI), Ishurdi, Rajshahi region, on 20-21 June, 1991. The following notes provide a capsule summary of our observations of the research and technology transfer protocol in place at SRTI.

The SRTI approach currently involves a mature technology cropping pattern of (sugarcane + potato + green manure), in which the sugarcane is planted in sets of paired rows with 120 cm between sets, 50 cm between pairs, and 45 cm between seed nodes within rows (from spaced transplanting, or STP, single cane nodes) on a staggered basis within the paired rows to a depth of about 20 cm. Other crops included in the "potato" portion of the pattern are lentils (up to three rows), cabbage, onions, mustard (requires too much water, normally), and the vegetable kang kong.

Optimally, the cane is planted in October and is harvested approximately 13 months later. The potato crop is seeded between the sets of paired rows in November and is harvested in February. The green manure (GM) crop is sown, in fields with sufficient residual moisture to allow for seed germination, during March, with plow under in July. The STP is done either from polyethylene bags, or from plain soil transplants. Under irrigation, germination of STP approaches 100%; under rainfed, about 97%.

The second major component of this improved technology is the use of single node stem material (a technology originating in India) in place of the traditional "end-to-end" stem cuttings (containing a minimum of 3 nodes). The savings in stem stock material which has to be retained by farmers is considerable. Instead of holding back 7 MT cane per ha for seed source, adopting farmers hold back 1.5 MT cane. This results in a more efficient use of the crop, as an additional 5.5 MT per ha can be sent to the mills for processing.

In addition, SRTI recommends that farmers use phytosanitary stem material for planting, to avoid major yield losses due mainly to red rot. The SRTI plant pathology laboratory produces a small quantity of moist hot-air treated (MHAT) seed, using another technology developed in the Indian Sugarcane Research Institute and in a treatment chamber provided by ARPII. Use of the MHAT technology along with STP would allow the production of an estimated 450,000 acres of treated seed in a period of five years. In five years of conventional propagation, a total of only 4,800 acres of sanitized seed could be propagated. The huge difference is due to the much larger numbers (by factors of three to four) of seed materials which can be produced each year by the STP method.

The spread of these technologies has been quite rapid. From one experimental plot four rows wide four years ago, 7,000 sugarcane producing families cultivating 30,000 acres of cane use the STP paired rows technology, of which 50-60% includes an intercrop.[2] Of the intercropped area, 70% includes potato cultivation, while the remaining 30% is covered by one of the other rotational crops. Fewer farmers have adopted the GM portion of the technology, since that component is most sensitive to residual soil moisture and the northwestern milled cane producing area is purely rainfed.

Two farmers were interviewed briefly in the one of the three village areas near SRTI where the technology has been adopted by about 90% of the sugarcane farmers. The first farmer stated that his previous yields were around 24 MT/ha, while this year, based on the success of the system last year, he is expecting between 70-100 MT/ha. This farmer now owns 4 ha of sugarcane lands. The second farmer harvested 75 MT/ha in 1989-90, expects 100 MT/ha in 1990-91, and averaged 25 MT before adopting the STP strategy. This second farmer functions as both a producer of STP stock for his neighbors and a private extension agent. He has assisted 20 farmers from his village to adopt the technology, based on their observations of his operation. He is also pleased with the potato component of the pattern, having received TK 4,000-6,000 per 1/3 acre plot in previous years.

SRTI has expanded from a cropping pattern approach to a FSR approach. Their approach includes two livestock components, one of which consists of the composting of the lower (non-productive) leaves of cane plants and unproductive tillers for cattle feed (a partial fermentation takes place). The other livestock component is a homestead poultry project, in which participant homesteads pay for one-half of the cost of a number of improved poultry breeds (the other half of the cost is supported by PL-480 monies), and the chicks are reared by one contact farmer who distributes the birds to those who have paid for them. The SRTI agroforestry approach includes improvement of indigenous mango and jujube trees, the former being sprayed with a plant hormone to reduce flower drop and thereby increase annual mango yield, and the latter being pruned back and grafted with improved (higher-yielding) jujubes.

What have been the keys to the success and spread of the SRTI technology? We have identified the following four factors which worked together to make the spread of the STP sugarcane pattern so rapid.

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[2] There are approximately 400,000 acres of sugarcane under cultivation in Bangladesh. Of this, the 30,000 acres under all combinations of the SRTI technology represents 7.5%. However, the proportion of cane grown for crush at mills ranges between 200,000-230,000 acres of this total. The remaining 170,000-200,000 acres of cane is used for ghur (molasses-like moist brown sugar) production. So the SRTI technologies have spread to between 13-15% of milled cane growers in this three-year technology transfer period.

1. It works. The combination STP-paired row sugarcane technology works dramatically, and farmers have seen that it works under field conditions and management conditions almost identical to their own. Yield improvements of two to three times harks back to the glory years of the green revolution.

2. A collaborative FSR approach was adapted to key conditions of the farmers. Since the components of the improved technology have been rejected by the Sugarcane Corporation, the technologies cannot be processed into approved materials for sugarcane extension agents. For this reason, technology transfer occurred first as researcher-to-farmer, and then as farmer-to-farmer. However, not just SRTI staff have been involved. Three of the FSR team have been full-time Ishurdi-based OFRD staff. Thus, inter-institutional collaboration in FSR is quite possible in the Bangladeshi context, if those at the local level are willing to try it. In addition, once acceptance of the STP-based cropping pattern technology was forthcoming, the team expanded its emphasis to include livestock and agroforestry (incremental improvement of indigenous fruit trees).

3. Adequate emphasis has been given to quality training. When the 40 farmers being trained in the two-day training session at SRTI were asked by the evaluation team if they didn't think it inconvenient to come all the way to Ishurdi for the training, and if they wouldn't prefer that the training be done near their homes and by sugarcane extension agents, they all replied no. In fact, a farmer spokesman for the trainees stated that the main problem with sugarcane extension is that the farmers always receive a mixed message. Some of the advice given is sound and correct; some is either just wrong or misleading. The problem is that the farmers don't know which part is which, whereas with direct research-farmer training, they know that they are receiving the proper instructions and materials.[3]

   The SRTI training coordinator has been responsible for training 700 farmers in the improved technology in training sessions held at SRTI headquarters during the past three years. For the last two years, farmers have been nominated for such training sessions by the managers of the sugarcane mills. This nomination process began when the mill managers became convinced that this technological advance was worth while.

   Training sessions last two days and appear to be quite cost-effective. Each participant receives reimbursement for transportation to and from the center and

[3] Also attending the two-day training was the "star" farmer trainee, who is now a farmer trainer himself. His main comment was that the current two-day training is too short. He would prefer a five-day training which would include integrated pest management (IPM) aspects.

TK 100 for food. SRTI has accommodations for housing 25 farmers at the training center; the other 15 farmers are housed by host cooperative farm families in Ishurdi. Each technical lecturer receives an honorarium of TK 100 for an hour's presentation. This type of incentive keeps SRTI technical staff interested in participating in the trainings, and has led to an excellent level of participation of staff.

Since the training of these 700 farmers has resulted in the spread of the technology to some 6,000-7,000 cane farmers in less than four years, it appears that an "average" trained farmer has passed along the technology to about 10 neighbors and/or relatives. This is quite a remarkable spread effect. Using any measurement device, this is impressive.

4. Adequate PL-480 support funds were provided through USAID. Few innovative approaches to research and technology transfer go far without funding. Since the mature sugarcane technology has not been endorsed by the Sugarcane Corporation, no sugar sales assessments (cess) for revenues have been approved for its promotion.[4] The FSR demonstration trials and related farmer trainings are 100% supported by PL-480 funds. The director of SRTI stated that, "without the FSR approach and PL-480 funds, the improved technologies would never have moved outside of the walls of SRTI."

The success of the SRTI STP sugarcane pattern technology has not been without its problems. The following problems should be addressed by Bangladesh policy makers.

1. Tug-of-War for SRTI between the MOA and the MOI. SRTI has been tugged and pulled back and forth between the Ministry of Agriculture and the Ministry of Industry at least three times during the past decade. Currently residing in the MOA, SRTI management expressed uncertainty as to where the research institute will be in the near future. Most recently, because of disagreements over placement of SRTI and autonomy, the Sugarcane Corporation has withheld the cess research assessment funds from SRTI. Such bureaucratic haggling can only be detrimental to work at SRTI.

2. Non-recognition of SRTI improved technology by the Sugarcane Corporation. Despite the dramatic yield increases shown in 30,000 acres of northwestern

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[4] The cess is an amount added to the retail price of each kg of sugar produced by each sugarmill in Bangladesh. The cess is a special tax which is earmarked for use by SRTI for research. Until last year, the cess was 6 paisa (TK 0.06); now it is 10 paisa. This amounts to 2.1% of the federal sugar surtax, which is TK 4.86, or 0.3% of the retail value of a kg of sugar (assuming a retail price of TK 29.73/kg).

Bangladeshi sugarcane acreage, the Sugarcane Corporation refuses to endorse the technology. Granted that this technology may not be appropriate to every sugarcane farmer, it would only seem natural that the sugarcane extension service would want to get behind a technology which is capable of doubling and even tripling yields in farmers fields. Unfortunately, they cannot until the technology is endorsed by the Sugarcane Corporation management. A lack of endorsement also means no extension materials on the methods can be prepared, nor can farmers using the improved technology be eligible for receipt of credit toward inputs purchases through the Corporation.

As near as the evaluation team could determine, this non-recognition is due to a combination of the fact that two components of this improved technology originated in India and the reality that there are institutional problems between the Sugarcane Corporation, SRTI, both current and former host ministries.

3. Excessive field losses may occur to early adopters of the improved SRTI methods. Early adopters of the SRTI STP methods received crop yield estimates based on their pre-technology yields. Such estimates, in the neighborhood of 25 MT/ha, meant that the mill issuing such an estimate would take only up to the first 18 MT/ha from these growers.[5] However, a farmer producing the minimum increased output of 45 MT/ha would be forced to leave in the field 27 MT/ha of cane (45-18=27). This yield is not lost, but it must remain in the field until all yield estimates have been crushed from all growers delivering cane to that given mill. Only then can the "excess" be crushed. The farmers we interviewed stated that in the first year, they lost an average of 30% of the yield of the "excess" due to moisture loss. SRTI has begun to document farm-level yields of adopting farmers, and the mills have begun to take these records into account in making their annual yield estimates.[6]

Estimated impact of the SRTI technology:

While outside of the scope of work (SOW) of the evaluation team to conduct impact assessments of project-assisted technology, we feel that it is important for ARPII (Supplement) to place more emphasis on impact assessment in the remaining two years of the contract. For this reason we recommend that ARPII (Supplement) spend time

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[5] Only 18 MT/ha would normally be accepted at any mill issuing a yield estimate of 25 MT/ha, because the normal planting practice would require a holdback of 7 MT of cane for seeding next year.

[6] This lag in mill yield estimates may partially explain why there is little or no national level increase in the yield of sugarcane. It may also be explained partly by the very recent spread of this technology.

assisting the ARIs with this aspect of the research and technology transfer process, either through the offices of one of the long-term team members, or through a series of recurrent short-term consultancies by an expert trained in impact estimates. These short-term consultancies would mix actual impact assessment with training Bangladeshis in impact assessment.

APPENDIX D, Section 2

CASE STUDY APPENDIX

When tropical Asian farmers are asked to name the most useful plant in their entire experience, most will reply bamboo. Bamboo shoots can be used for food, the poles for construction, fencing and boats, the leaves for shade and mulching, and the branches for firewood and paper making. Bamboo produces 6 times the biomass of pine per unit of area and time. It can tolerate moderately heavy rainfall in the hottest tropics to warm temperate zones. It can flourish on a wide variety of soil types from sea level to high attitudes.

In fuel wood, timber and pulpwood deficient areas such as Bangladesh the fast growing strong, highly adaptable bamboos are urgently needed for construction, firewood, and embankment stabilization.

At the Bangladesh Forestry Research Institute (BFRI) two very valuable nature technologies have been developed recently. One is a rapid method of multiplication of young plants and the other is a simple low cost method of prolonging the life of construction bamboo through a chemical solution passed through the stem.

Propagation generally utilized clump off-shoots, rhizomes or culm cuttings. The BFRI method uses the young axillary buds for transfer into a well aerated soil medium where the young root primordia can be assured of a high oxygen supply as the seedling develops its young rhizome, shoot and leaves. The young plantlet grows in this poly bag of medium for about 5-6 weeks before being set into the growing field or plantation. With this method 30 to 40 young plants can be grown from one mother plant, an increase of 5-6 times more than the old method.

The preservation technology involves the sap displacement of a newly cut bamboo stem of 9 to 10 meter in length, with branches, and leaves still attached. One end is lowered slightly and a container placed beneath, the other end is attached to a rubber hose that leads to a closed container which can be slightly pressurized. Within the container, a 20% solution of copper sulfate, sodium chromate and boric acid is placed. The next step involves a bicycle tire pump which is used to develop a firm pressure on the solution as it passes through the conducting vessels in the still "living" bamboo stem.

As the pressure is applied the clear sap of the stem can be seen dripping from the open stem end. As the displacement continues the color of the blue preservative becomes evident. Thick walled bamboo used for poles, posts and trusses is often Bambusa vulgaris and Bambusa balcoa. These heavy stems require sap displacement, but thin walled bamboo (Malacona bacifera) and sungrass (Imperata auramdianaroae) which are

used for the walls and roof as mats can be soaked in a 10% solution of this simple solution known by its short designation CCB. Aging tests indicate that the treatment will prolong the life of these vital building materials up to 10 to 12 years, as compared to the current life expectancy of 2 to 3 years. It quite obvious that these two technologies have great promise for the rural poor and for future commercial operations.

Extension Demonstrations have exceeded the supply of Bamboo seedlings BFRI can supply which indicates the need for a new Agri-Business to serve this rapidly adopt technology. The CCB technology is being considered by venture capital sources, thus large scale production should be available in a year or less.

APPENDIX E

Relevant Background Information Concerning the Agriculture Sector in Bangladesh

Section 1.	An Overview of Agriculture in Bangladesh Growth Performance and Potentialities
Section 2.	Relative Distribution of Research Effort in Selected Agricultural Research Centre of Bangladesh, Using Agricultural Functions Matrix
Section 3.	Commodity Values and Scientific Input Relations, National Agricultural Research System, Bangladesh
Section 4.	Distribution by Funding Institution and by Sub-Sector, Bangladesh, Millions of Taka, 1989-1990.
Section 5.	Public Investment Program and Public Expenditure Program
Section 6.	Alternative Donor Funding for Research and Extension: The Agricultural Development Fund (ADF)
Section 7.	Organograms
Section 8.	The Revised Curricula for Undergraduate Education
Section 9.	Figures indicating relative importance of and of agricultural research.
Section 10.	Recommended Rice Varieties Released From BRRI
Section 11.	Crop Calendar of Bangladesh
Section 12.	Results of Evaluation Team Mini-RRA of Research/Extension Professionals in Bangladesh

APPENDIX E, Section 1

AN OVERVIEW OF AGRICULTURE IN BANGLADESH GROWTH PERFORMANCE AND POTENTIALITIES

A.U. Chowdhury

Agricultural System

Crops, livestock, forestry and fishery - all together form a system in which the components are interdependent. This had been the traditional agricultural system in Bangladesh peasant economy. This practice is still in vogue but particularly with the advent of the Green Revolution in the early 70's, the government as also the donors' preoccupations with the crop sector have left other sub-sectors inadequately attended to. This has created imbalance in the system and problems of overall development. In the crop sector, production of foodgrains received the most attention from the policy makers with some undesirable implications for some important crops like pulses, oilseeds etc. having high nutritional and soil regeneration qualities.

Cereal Production

Cereal production witnessed a modest growth rate of about 3.0 percent annum during the period from 1975-76 to 1986-87. This was made possible mainly by the superior performance of the growth rate of yield of cereals at about 2.0 percent per annum brought about by varietal shift, changes in crop composition and better cultural practices consequent upon rapid expansion of irrigation particularly modern irrigation. The dry season crops - wheat and boro which at the phenomenal rates of about 17.0 and 8.0 percents per annum respectively provided the main philip to the above mentioned overall growth rate of cereal production.

The period from 1980-81 to 1986-87 is marked by a declined growth rate of about 2.2 percent per annum of cereal production. Underlying this, there are factors like declining rate of growth of overall yields of aus, boro and wheat resulting mainly from fall in HYV yields and rapidly declining rate of growth of area under wheat etc. Aman, however, presents a better picture with superior performance of yield both, local and HYV. In the two flood years, 1987-88 and 1988-89, respectively production declined and marginally increased with 16.46 million tons in the former and 16.57 million tons in the later years. The year 1989-90 marked a record of 18.46 million tons of cereal production. it is to be noted that aman production spearheaded the resurgence. The growth momentum of 1989-90 is attributable to the increased use of modern inputs consequent upon tax removal on diesel engine, promotion of private trade in minor irrigation equipment,

removal of import duties and standardization restrictions from power tillers, elimination of many restrictions on pesticide importation, decontrolling of fertilizer distribution and sales by allowing dealers to purchase directly from all factories. Government programmes use approximately 1000 demonstration plots to show farmers the benefits of applying gypsum to repair sulphur deficiency.

Non-cereal Production

In the aggregate, noncereals present a case of lower growth rate of gross value of about 2.0 percent per annum during the period from 1975-76 to 1986-87. Jute and sugarcane show up modest growth rates of 3.3 and 3.5 percents respectively. Banana and vegetables come up with growth rate of respectively 2.6 and 2.3 percents. But growth rates of most other crops are negative or negligible e.g. pulses (-2.3%), oilseeds (0.8%), sugarcane (0.9%), tobacco (-0.9%), chillies (-1.2%). Like cereals, the year 1989-90 has been a good year for most of these crops.

Forestry date on forest resources are not very reliable particularly of village forest products which provide about 80.0 percent the country's forest output. Forestry sub-sector exclusive of the village forest products displays a moderately high growth rate of value added of about 5.0 percent per annum in the recent years i.e. in the 80's. It is important to note that reserve forests and particularly the village forests are being depleted at a high rate.

Fisheries

The fishery sub-sector also come out with a moderately high growth rate of fish products of 4.0 percent in the 80's. The main source of this performance is the marine fish catch. It is discomforting to note that the present level of fish catch from inland sources is 20.0 percent less than the levels of the early 70's.

Livestock

Date on livestock sub-sector is also less reliable. The World Bank reports (cited in M.A. Hossain, July 1988 UNDP/GOB project report) an absolute decline in meat production, stagnant milk output but increased egg production in 1987 relative to 1977 against the BBS Statistics of modest growth of terms of growth of value of this sector measured in terms of growth of value added can be around 2.0 percent (M. Hossain 1991).

Implications of Agricultural Development Strategy

Past agricultural policies have been synonymous with crops particularly the production of cereal development strategies. The narrow growth base of agricultural policies have

meant concentration of not only research, extension, price, input supports etc. to these crops but also rather indirectly reallocation of land from noncereal crops particularly pulses and oilseeds to rice and wheat. As a result, net per capita cereal production has improved in recent years as compared to the low levels of the 70's but excepting potato per capita production of pulses, oilseeds, sugar and vegetables etc. show a decline. Inland fish production has fallen, meaning decreased per capita fish consumption. In respect of forest resources, the situation is approaching a state of concern due to rapid depletion of forest area of all types. Thus with less than 15.0 percent of land under forest area, the problem of ecological balance is growing. The weakness of the livestock sector is manifested in the shortage of animal draft power. Not only are draft animals are short in supply, they are also often unhealthy and diseased.

Pulses and Oilseeds

Pulses and oilseeds appear to be losing ground to HYV boro wherever irrigation is available because of their poor competition in relation to boro. The main problem of increasing the production of pulses is the lack of availability of HYVs for the winter season. Progress in respect of developing suitable HYVs for summer pulses is yet to be satisfactory. It is a matter of concern that due to secular decline in production, per capita consumption of pulses has declined from 11.0 grams in the early 60's to about 8.0 grams in the mid 1970s and to about 6.0 grams in the mid 1980s. Serious research efforts are needed to upgrade the position of this important crop which is a cheap source of protein, provides fodder for livestock, and improves soil fertility. Immediate measures are required to ensure adequate and timely seed supply, plant protection, post harvest preservation, and stable market.

Oilseeds too, mustard to be specific which accounts for 64.0 percent of oilseed area, figure out as incompetent in relation to boro. Some HYVs of mustard are available but the area coverage is very small, around 15.0 percent of the cropped area. Main reasons of low HYV adoption rate are uncertainty associated with the availability of HYV seed, want of pesticides and extension services and above all ignorance about the technology.

Potato

Some measures aiming at demand push and removal of supply constraints can brighten their prospects. Demand push measures would entail popularization of potato consumption in the main diet, widespread use as processed and semi-processed food and exploring export potentials. Stabilization of seasonal price fluctuation, provision of adequate storage facilities, production of sufficient seeds an its timely distribution would ease up the supply condition.

Vegetables

Growth of vegetables has come mainly from acreage expansion. Yield in recent years has fallen or stagnated. Vegetable production, to a large extent, is dependent on the supply of imported seeds which will number about 140 for 38 types of vegetables and fruits. It is encouraging that improved local HYVs are being made available for a number of important vegetables, like brinjal, raddish, cabbage, tomato, etc. Development of infrastructure, storage facilities along with seed development will facilitate growth of vegetables.

Maize

Maize is a very insignificant minor crop but appears to offer a bright prospect in view of

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its high profitability and nutritional value. Except potato, it is more profitable, provides more calories and protein than most of the winter crops. It has enormous agronomic flexibility, adaptability and versatility of use e.g. green cobs as snacks, dry grain as human food in the main diet, as poultry feed, as raw-material for starch production, the plant as livestock fodder etc. Phased production and promotion strategy of maize should receive consideration. It is worth noting that the Chittagong Regional station of BARI has found two technologies in this regarding, maize with chili and maize with sweet gourd.

Livestock

Cattle comprise the predominant component nearly about 90.0 percent of the total resources followed by goat and sheep, buffalo and poultry in terms of animal unit. Most of the cattle are of indigenous breed: small in size, slow growers and poor milk producers. However, the advantage of these animals are that they are more resistent to disease and climatic stress, need less care and feed than exotic or crossbreeds and are relatively cheap. With improved feeding and management they can produce twice as much milk as their present yield. Also small-sized indigenous animals are not particularly inferior to exotic or crossbreed animals (Hoppen H.J. 1969; Sarker, R.I. 1981) as draft power in a tropical country like ours. The main problems of development of cattle are resources are inadequacy of feed and fodder, paucity of veterinary services and high incidents of thefts.

In view of draft power shortage in the country, the Government has liberalized the imports of power tillers. Some local private enterprises (e.g. in Sylhet, and Savar in Dhaka) are producing power tillers. To encourage local producers, same restrictions on the imports of the power tiller implements excepting the engine may be imposed in a phased way. Given agroecological conditions, some opine that power tillers can cultivate about 30.0 percent of the cultivated land. This means that animal draft power will continue to be the dominant source cultivating land. Therefore, more attention needs to be paid for the improvement of the quality of draft animals by improving feed and fodder supply and providing better veterinary services. Same demand conditions can be released by improving the traditional implement and yoking system, encouraging minimum and zero tillage practices.

Black Bengal, the main breed of goat, is very prolific in reproduction and famous for its quality of skin and meat. Main problems of development of this resource is the shortage of breeding bucks and severe feed scarcity during rainy season due to the unavailability of prepared feed. Attention is called for in these regards.

Most of the chicken and ducks are indigenous: genetically poor, small in size and poor egg producers. The survival rate of hatching is 50 percent. Poor management, disease and feed deficiencies are the main constraints. Production of poultry in the backyard as

well as in the commercial extensive farm has to be encouraged. Production of baby chicks, pullets and cockerels in the existing DLS form has to be strengthened and their distribution among the farmers be supplemented by a package of support service and farmers training on poultry rearing. There is also need of poultry breeding farms for production of hybrid clucks for broilers and layers.

Fishery

With an inland water areas of about 4.3 million hectares including 2.8 million hectares of paddy fields that remain under water for 3.6 months, a marine belt of 66,000 square kilometers and an extensive costal zone, the water-land ratio of Bangladesh is one of the highest in the world and provides excellent opportunity for healthy growth of the fishery sector. Yet per capita fish consumption has fallen and remains very low at about 8 gram against the national objective of 12 gms, part of this is due to exports of marine and coastal fishes, and fish prices have been soaring. Irrigation and water control measures have strong bearings on inland fishery, which contribute about 80 percent of the total fish products, but until about the end of the Third Five Year Plan fish did not form an integral part of the developed projects of the water sector. In fact a development policy was lacking and most effort has been on rather ad hoc basis. M.P.O. now addresses the issue of coordinated approach to water use. The M.P.O. forecasts a 35 percent diminution in per capita fish consumption by the year 2005 which will have serous implications in terms of protein deficiency. The diminution results from decreased availability from floodplains.

The broad issue that confronts the sector is the strategy of development - whether to emphasis coastal and marine fisheries or inland fisheries. The issue is linked with the national objective. An export oriented strategy would call for emphasis on marine and coastal fishery while equity and poverty biased strategy would need to stress inland fishery development.

Ponds contribute about 19 percent of inland Fish Production, currently less than 50 percent of the total pond area is under production. Extensive development of pond fishery is constrained mainly by prevalence of multiple ownership. This can be overcome by leasing out such ponds to NGO's like the Grameen Bank. Introduction of induced spawning technology has created new opportunities for substantial progress in cultured fisheries. Better management also increases yield substantially. Different studies reveal that intensive culture of fish can increase production by more than 12 fold (cited in S. Minkin, 1988).

The Floodplain as a natural resources offers an excellent opportunity for a growing fishery, and output can be increased by these sources by 2 to 3 fold in 2005 from the level of the mid 80s (World Bank Report, 1987). This scenario seems to be plausible with

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appropriate measures. These include replacement of short term lease of public water bodies, because this leads to overfishing and disincentive for development investment, by longer term lease. Appropriate measures to minimize the adverse effects of DFC projects are needed. Adoption of a dominant cropping pattern that would not involve major DFC projects (e.g. deep water aman mixed with aus in Kharif season followed by boro in winter); creation of hatcheries; stocking of species for polyculture etc.

Bangladesh is endowed with favorable resources for shrimp culture with tidal land, congenial saline water and warm temperature. The major problem in this area is the conflict between shrimp culture and rice production particularly of small farmers. It is necessary to resolve the issue by instituting a water management policy that will support development of brackish water shrimp farming and at the same time minimize adverse effects on agricultural land. Assistance should be given to small farmers to practice shrimp culture on a cooperative basis rather than leasing out their land to large farmers. It is necessary to modernize shrimp production in respect to technology for the improvement of shrimp yield which is precariously low compared to India, Thailand, Indonesia etc. Extensive culture combined with improved technology could increase shrimp yields from the current 20 MT to 60 to 90 MT per acre.

Marine fishery is under pressure and the short-term future growth prospect is likely to be limited. The picture can, however, be improved by putting emphasis on the production of pelagic rather than demersal fishery, collecting trash fish which are dumped into the sea and also preventing intrusion of foreign trawlers. The long term prospect lies in better management, conservation, construction of land facilities etc. and output can be about 28 percent higher in 2000 from the present level (World Bank). ASR report provides a number of guidelines and suggestions which need consideration.

GRAIN PROBLEMS AND PROSPECTS

Aman

Aman, the main cereal and low input using crop is still grown primarily under rainfed conditions. HYV coverage of this crop is around 30.0 percent. The new HYVs, BR-22 and BR-23, offers optimism to raise HYV coverage and hence production substantially. For about 22.0 percent of the total aman area which grows deep water aman, no HYV is available. BRRI is expected to release an HYV for deep water aman.

Aus

Aus, a low yielder, having HYVs of about 20.0 has been lackluster in growth performance. With the release of BR-20 and BR-21 dry land farming aus is expected to come out as a prospective cereal. Yield prospect of these varieties is about 3.0 times that of local varieties. These varieties are suitable for high rainfall areas which constitute about 50.0 percent of the total aus area.

Boro

Boro has been the cutting edge of agricultural development in Bangladesh. Boro has an HYV coverage of about 90.0 percent. Therefore, future prospects of this crop lies in greater expansion of irrigation, better irrigation and fertilizer management. Longer term prospects of this crop should be sought in varietal improvements.

Wheat

Wheat does not seem to offer further prospects. Bangladesh lacks long, cool winter suitable for wheat production. Wheat is encountering soil exhaustion and sterility problems.

Jute

Jute is the main export earner of Bangladesh despite competition from synthetics. Growing awareness of ecological problems with synthetic matters is expected to raise demand of jute goods. Quality improvement of jute product is necessary. The BJRI has developed a technique called 'ribon rating' for improvement of the quality of jute fibre. One of the most important measures at increasing jute production is the stabilization of price at growers level.

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APPENDIX E, Section 2

Relative Distributions of Research Effort in Selected Agricultural Research Centre of Bangladesh, Using Agricultural Functions Matrix

APPROXIMATE NUMBER OF PROJECTS OR EXPERIMENTS REPORTED

Function	BARI	BRRI	BJRI	BINA	SRTI	BFRI	FRI	BAU
IMPROVEMENT	103	75	57	56	33	30	10	9
PRODUCTION	78	95	37	20	41	32	23	7
PROTECTION	68	86	29	18	28	17	4	6
HARVESTING/HANDLING	4	11	9	-	7	15	3	1
MARKETING ECONOMICS	9	18	16	-	3	6	3	1
UTILIZATION PROCESSING	-	4	9	-	1	15	2	1
HUMAN NUTRITION	-	4	-	-	2	2	-	-
TECHNOLOGY DEVELOPMENT	12	10	-	-	3	3	-	1
FARMING SYSTEMS	15	13	14	-	4	9	4	1

SOURCES: Research Reports of research facility (average of two or more years reports, main station activities only).

APPENDIX C, Section 3

Some Commodity Values and Scientific Input Relations, National Agricultural Research System, Bangladesh

Agricultural Commodity	Total Value Products Million Taka/86(1)	Percent Share of Total Value	Number of Scientists Involved (2)	% Share of Scientists Involved
Rice	108,890	48.41	238	26.09
Wheat	4,962	2.21	17	1.87
Other	141	0.62	12	1.31
Other Food Crops				
Fruits	9,305	4.14	21	2.30
Oil seeds	2,344	1.04	26	2.85
Pulses	3,716	1.65	9	0.99
Spices	3,116	1.39	NA	
Sugarcane	5,225	2.32	73	8.01
Vegetables	3,471	1.54	36	3.94
Potato	3,013	1.34	26	2.85
Cash Crops				
Tea	3,172	1.41	32	3.52
Fibre crops	10,756	4.78	163	17.87
Livestock	31,594	14.05	75	8.22
Forest Products	18,263	8.12	92	10.09
Fisheries	16,927	7.54	92	10.09
TOTAL	224,895	100.00	912	100.00

(1) From Agriculture Sector Report UNDP 1990
(2) From Agriculture Sector Review USAID 1989

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APPENDIX E, Section 4

Distribution by Funding Institution and by Sub-Sector, Bangladesh, Millions of Taka, 1989 - 1990.

Donor	No. of Projects	%	Project Cost* (in million Tk)	% of Total Cost
1. UNDP/FAO	32	29	510.12	16.3
2. Ford Foundation	11	10	152.89	4.9
3. USAID	5	5	573.40	18.4
4. ADB	12	11	156.87	5.0
5. IDA/World Bank	11	10	375.96	12.0
6. Others	39	35	1,52.22	43.3
Total	110	100	3,121.46	100.0

* Reflects total cost of projects with TA component

Subsector	No. of TAS	%	Project Cost* (in Million)	% of Total
1. Crops	72	65.45	2,18.45	80.68
2. Forestry	11	10.00	262.38	8.41
3. Fisheries	17	15.45	265.43	8.50
4. Livestock	10	9.09	75.20	2.42
Total	110	100	3,21.46	100

* Reference total cost of projects with TA components

Source: Study for Evaluation of Improvement of Technical Assistance in Bangladesh, 1990, UNDP Bangladesh Project Management Institute.

APPENDIX E, Section 5

Public Investment Program Based on ADB Budget Allocations in Bangladesh FY 81-89 taka in crores (1 crore = 10 million)

	FY81	FY82	FY83	FY84	FY85	FY86	FY87	FY88	FY89
Crop Subsector	286.70	309.80	300.40	357.00	244.60	166.10	160.10	201.00	216.30
Forestry Subsector	23.80	40.00	36.60	41.30	35.40	24.70	47.30	43.00	56.10
Fisheries Subsector	32.90	37.40	31.80	55.90	47.10	23.00	32.70	56.90	64.30
Livestock Subsector	14.80	32.90	24.00	34.00	33.50	16.00	30.40	70.30	47.40
Total	358.20	420.10	392.80	488.20	360.60	230.00	270.50	371.20	384.10

Public Expenditure Program Crop Sub-sector Based on ADP Budget Allocations in Bangladesh FY 81-89 taka in crores

	FY81	FY82	FY83	FY84	FY85	FY86	FY87	FY88	FY89
Extension	24.80	31.60	11.30	13.00	11.50	12.60	14.10	24.90	27.20
Research	11.70	19.00	31.00	26.90	42.90	42.80	64.00	72.00	83.70
Input Supply	154.70	171.50	167.50	252.70	151.40	90.70	53.10	39.10	39.70
Food Storage	80.70	69.70	68.10	38.80	24.60	11.10	16.30	31.10	26.90
Other	14.80	18.00	22.50	25.60	14.20	8.90	12.60	33.90	38.80
Total	286.70	309.80	300.40	357.00	244.60	166.10	160.10	201.00	216.30

APPENDIX E, Section 6

Alternative Donor Funding for Research and Extension: The Agricultural Development Fund (ADF)

Background:

The concept of an Agricultural Development Fund (ADF) as a conduit for channeling donor funds for innovative research and extension activities is not new. Contract research has been tried before in Bangladesh; in addition, the USAID-funded Jordan National Agricultural Development Project (JNADP) included such a provision in 1986. However, this concept, to systematically channel funds into research and extension activities using a standard proposal form and a broad-based client-oriented technical peer review committee, needs to be adapted to the administrative realities of Bangladesh. Contract research has not worked well in the past in Bangladesh; the question remains as to whether any similar method can. What is not being questioned is the need for a change in the way in which major Bangladeshi agricultural research and extension activities are funded from outside donors.

Through the ADF and elimination of most donor project-specific funding, it is expected that both farmer and rural household responsive research and extension activities will be implemented more quickly and efficiently in Bangladesh. Such increases in implementation efficiency should occur as control over approved budgets passes quickly and directly to the implementing institution. However, it must be remembered by these institutions that along with such direct control goes direct accountability to BARC and the appropriate donor. Poor track records in terms of either a real lack of progress in technical research or technology transfer, or irregularities in expenditures of project funds, will lead to termination of that specific ADF Project, and release of remaining funds, which had been set aside for that project, for use by future projects.

Specifics of the Agricultural Development Fund (ADF):

To be instituted by USAID in the future extension of the ARPII (Supplement) project, a multi-donor Agricultural Development Fund can be set in place in Bangladesh. Once in place, the ADF can act as a depository of agricultural development funds from other donors. The ADF would replace most, if not all, specific host- and non host-country project funding agreements, and would also house accumulated PL-480 monies in local currency. BARC would administer the ADF on behalf of all institutions working in the agricultural development field, regardless of whether or not such institutions were administered by the MOA.

The ADF would be implemented as follows:

1. An ADF proposal selection and review committee should be created to serve BARC and rural Bangladesh farm families. The committee should consist of a non-voting Chairman and eight voting members, as follows:

a. The EVC, BARC (Chairman, non-voting member),
b. A farmer representative[7]/,
c. A representative of Bangladeshi NGOs[8]/,
d. A representative of the major Bangladeshi Universities[9]/,
e. The Director (Research), BARI,
f. The Director (Research), BRRI,
g. The Director (Research), BLRI,
h. The Director (Research), BFRI, and
i. The DG, DAE.

2. The ADF Proposal Committee should develop and agree upon a format template for proposal submission and evaluation. This template could be called the ADF Proposal Form. It should be developed by adapting the existing BARC research proposal format, but can be expanded to include future research and technology transfer activities. The ADF Proposal Form should contain two major sections:

a. Identification: title of proposed research or extension activity, host (submitting) institution, principle investigator, date of submission, etc.

b. Summarized implementation details: statement of justification, research or extension objectives, annual and overall budget broken down into major categories of expenditures, etc.

Finally, the ADF Proposal Form should contain space for BARC and donor approval

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7/ Nominated by DAE DAOs and chosen from among these nominees by the Secretary of Agriculture, the first farmer representative will serve one year of a three-year normal term, and will be replaced for the 1992-93 Rabi season. The second and subsequent farmer representatives will all serve three-year terms from that point onward.

8/ The first NGO representative will be chosen from among the managing directors of Bangladeshi NGOs to serve a two years of a three-year term. The first NGO representative will be replaced for the 1993-94 Rabi season, and the second NGO representative will serve a normal three-year term.

9/ Chosen from the universities of BAU, DU, CU and RU, the first representative of major Bangladeshi Universities will be chosen from among the full professorial faculty of those disciplines impinging on agriculture. This first representative will serve a normal three-year term, and will be replaced for the 1994-95 Rabi season.

signatures, a section for comments on proposal modification, and a small section for comments as to why a particular proposal must be rejected. ATTACHMENT E-2-1 is an initial draft ADF Proposal Form.

3. The BARC ADF Proposal Committee should convene a one-day orientation workshop to introduce the ADF proposal concept for conducting contract research in Bangladesh. Those attending this workshop should be:

a. The DGs of all relevant Bangladeshi ARIs,

b. National Commodity Research Heads (including crops, livestock, fisheries, and agroforestry),

c. Heads from agriculture-impinging departments of participating Bangladeshi Universities, and

d. Representatives of all Bangladeshi NGOs involved in agricultural development.

During this workshop, the ADF Proposal Committee should explain the reasons for using the ADF Proposal Form and the way in which the form templates are to be completed by all institutions applying for research or extension funds.

4. Most, if not all, future foreign-funded research and extension activities should receive funds to be administered directly by these participating ARIs, universities, or NGOs. Upon receiving ADF proposal approval from BARC, the agreed-upon amount of funds for the first year's activities should be transferred from the general ADF account in the Ministry of Finance to a specific account, opened solely for the purposes of funding that particular proposal, in either the Agricultural Development Bank or in a Commercial Bangladeshi Bank, in the name of the implementing institution. While accountable to both BARC and the appropriate donor (or donors in case of jointly-funded projects) in the annual review of project progress, the Director of the recipient institution should also be responsible for timely disbursement of ADF Project funds.

5. To be eligible for on-time funding, each new research or extension ADF Proposal Form should be submitted to the ADF Proposal Committee no later than one cropping season in advance of the proposed activity start-up date. The BARC ADF Proposal Committee should meet and act upon each and every newly-submitted ADF Proposal no later than three months prior to each major cropping season (corresponding to the prevalent rice cropping seasons of aus, aman, and boro).

6. In each case where the ADF Proposal Committee either requests that the proposal be modified, or rejects the proposal, a short justification or explanation for the reasons why

should be attached to each returned proposal form. An ADF Proposal Form returned for modification should be revised according to the committee's suggestions and re-submitted for reconsideration in the same review cycle. An ADF Proposal Form rejected may be re-written and submitted for committee reconsideration during any following season.

7. The BARC planning unit should be activated and trained to monitor ADF project implementation on an annual basis.[10]/ Such evaluations of progress should be submitted to the appropriate donor, and to the BARC ADF Proposal Committee, in advance of release of the next year's supporting funds. In addition, the implementing institution should routinely monitor the progress of the funded research and submit semi-annual reports to both BARC and to the appropriate donor(s). Only ADF projects making satisfactory progress should be eligible for further annual disbursement of funds.

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[10]/ The exception is year one of any funded project or activity. To allow timely disbursement of funds for year two, the planning unit will carry out evaluations of first-year projects by the end of the second season following their initiation. Subsequent evaluations will be carried out annually, always being submitted to the ADF Proposal Committee a season prior to required disbursement of annual funds.

BARC ADF Proposal Form

BANGLADESH AGRICULTURAL RESEARCH COUNCIL
Received by BARC ADF Committee on Date : _____

by : _____

DEVELOPMENT PROPOSAL: ADMINISTRATIVE

TITLE :

SUB-TITLE :

Project will contain elements of (check all that apply):

Research ☐ Commodities/Units _____, _____, _____,

Extension ☐ _____, _____, _____, _____,

OFSD ☐ _____, _____, _____, _____,

Project is Independent ____, Interdisciplinary ____, Interinstitutional ____

Name of Implementing Institute/Agency/Station(s)/Unit(s):

Primary:----------

(Check which: ARI ☐ University ☐ NGO ☐

Collaborating:----------

(Check which: ARI ☐ University ☐ NGO ☐

Project Coordination.

Institutional Program Coordinator: _____ _____
Name Institute

Principal Investigator : _____
Name Institute

Collaborating Investigators : 1. _____
Name Institute

2. _____
Name Institute

3. _____
Name Institute

Local Site Coordinators : 1. _____
Name Institute

2. _____
Name Institute

3. _____
Name Institute

Proposal submitted by: (Print name): _____
Name Institute

Signature : _____

Designation : _____

Proposal endorsed by: (Print name): _____
Name Institute

Signature : _____

Designation : _____

Proposal approval: Priority Rank : _____

☐ as submitted with budget approval

☐ as modified (below) with budget approval

☐ as submitted with budget modification (see attachment)

☐ as modified (below) with budget modification (see attachment)

☐ Not as submitted

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Signature: _____ _____

Name (print):_____Name (print):_____

Director General, BARC Donor Agency Representative

Signature :_____ Signature :_____

Name (print):_____ Name (print):_____

BARC ADF Committee Member BARC ADF Committee Member

The BARC ADF Committee has made the following changes in the submitted proposal.

1._____

_____

Reason:_____

_____

2._____

_____

Reason:_____

_____

3._____

_____

Reason:_____

_____

4._____

_____

Reason:_____

_____

DEVELOPMENT PROPOSAL: TECHNICAL SUMMARY

PROJECT TITLE:

PURPOSE AND JUSTIFICATION:

OBJECTIVES:

WHY PROJECT IS IMPORTANT NOW:

MATERIALS AND METHODS SUMMARY:

BUDGET SUMMARY:

Expense	Yr1 (19) Tk $	Yr2 (19) Tk $	Yr3 (19) Tk $	Yr4 (19) Tk $	Yr5 (19) Tk $	Project Totals Tk $

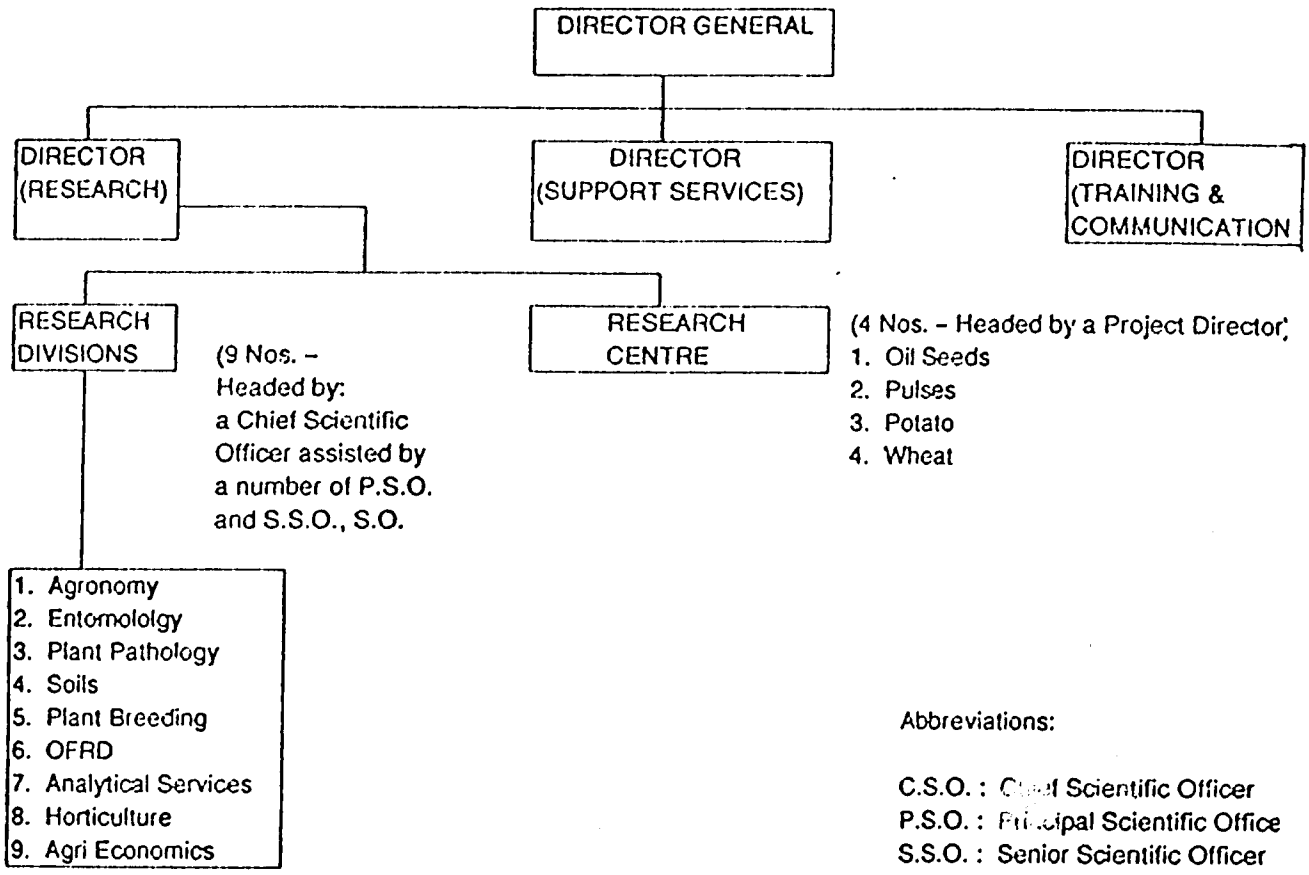
BARC ADF Committee amended Budget:

Expense	Yr1 (19) Tk $	Yr2 (19) Tk $	Yr3 (19) Tk $	Yr4 (19) Tk $	Yr5 (19) Tk $	Amended Project Totals Tk $

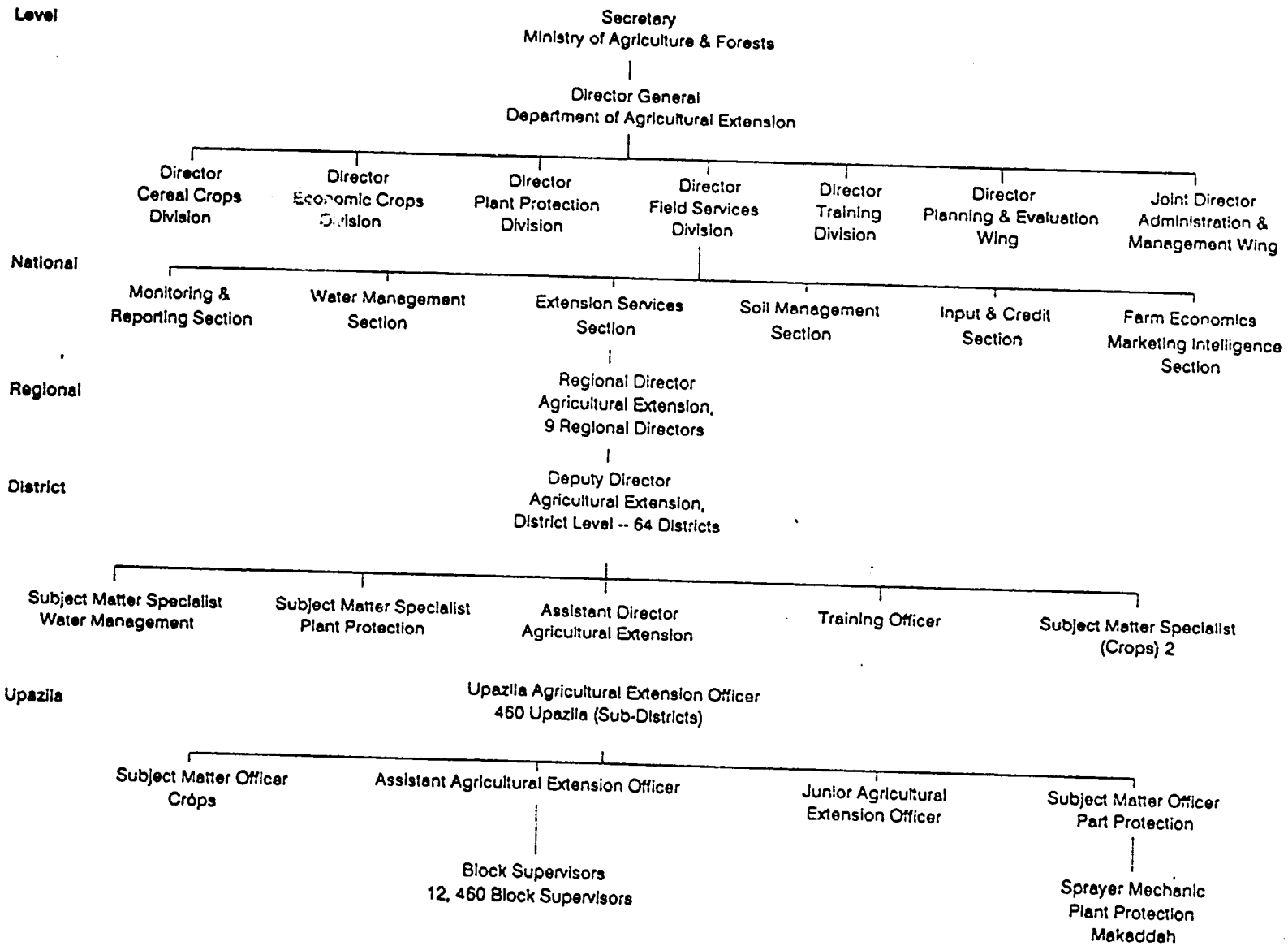
APPENDIX E, Section 7

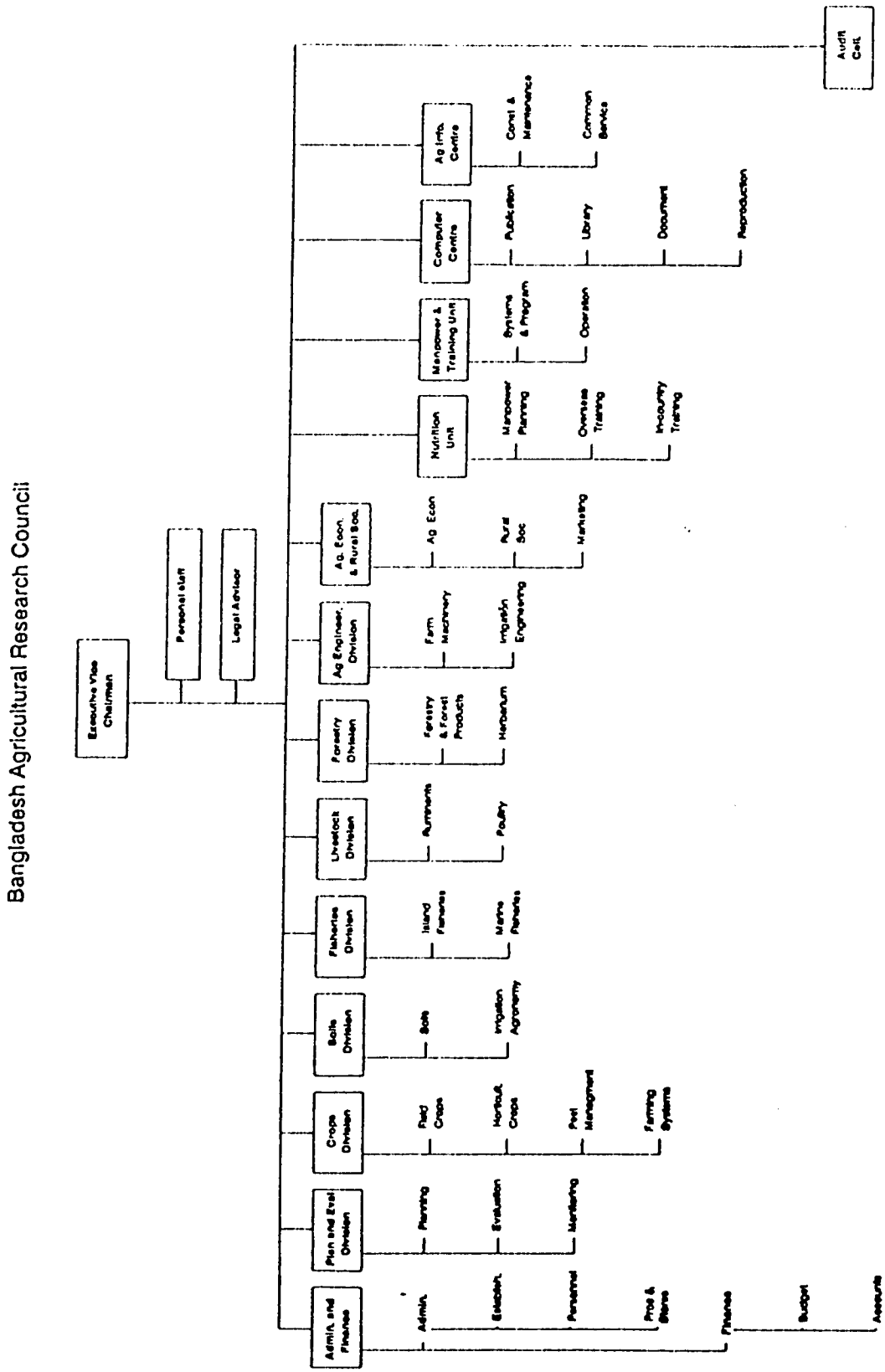
Organogram of Sample Agricultural Research Institute in Bangladesh

BARI



Organograph of Department of Agricultural Extension




Bangladesh Agricultural Research Council
Executive Vice Chairman
Personal staff
Legal Advisor
Audit Cell
Ag Info. Centre
Const & Maintenance
Common Service
Computer Centre
Publication
Library
Document
Reproduction
Manpower & Training Unit
Systems & Program
Operation
Nutrition Unit
Manpower Planning
Overseas Training
In-country Training
Ag. Econ. & Rural Soc.
Ag Econ
Rural Soc
Marketing
Ag Engineer. Division
Farm Machinery
Irrigation Engineering
Forestry Division
Forestry & Forest Products
Herbarium
Livestock Division
Ruminants
Poultry
Fisheries Division
Inland Fisheries
Marine Fisheries
Soils Division
Soils
Irrigation Agronomy
Crops Division
Field Crops
Horticult. Crops
Post Management
Farming Systems
Plan and Eval Division
Planning
Evaluation
Monitoring
Admin. and Finance
Admin.
Establish.
Personnel
Proc & Store
Finance
Budget
Accounts

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APPENDIX E, Section 8

The Revised Curricula for Undergraduate Education

Bangladesh Agricultural University, Mymensingh

From: Report of the High Level Expert Committee on Agricultural Education Vol. 1, Main Report, The University Grants Commission, Dhaka, November, 1990.

		B Sc Agriculture	B Sc Husbandry	B Sc Forestry	B Sc Fisheries
a.	Improvement	10	21	3	15
b.	Production	21	48	14	31
c.	Protection	33	9	8	10
d.	Harvesting/Handling	-	9	22	10
e.	Marketing Economics	3	4	3	12
f.	Utilization and Processing	-	9	15	11
g.	Human Nutrition	-	-	-	-
Total		67	100	65	89

II. Coursework Related to Background Subject Matter (Credit Hours)

	B Sc Agriculture	B Sc Husbandry	B Sc Forestry	B Sc Fisheries
Animal Science	3	10	3	30
Basic Science	14	12	-	18
Earth Science	2	-	2	6
Plant Science	12	6	10	3
Social Science	5	2	7	6
Soil Science	17	3	8	3
Agricultural Engineering	3	3	4	9
Agricultural Extension	9	3	4	3
Farming System	3	-	-	-
Fisheries	1	-	-	14
Forestry	3	-	9	-
Language	3	2	6	9
Math. Statistics	4	6	9	9
Electives	2	15	13	-
Total:	81	62	75	110
Grand Total:	148	162	140	199

APPENDIX E, Section 9

Brief Description of the Student Enterprise Program

An instruction program for fourth year agricultural college students has been developed to prepare graduates for employment with private agricultural concerns, supporting industries, or for self employment as a full time commercial farmer. The program has gained wide acceptance throughout developing, as well as developed nations, as agricultural colleges have been faced with the realities of what the business world demands from training programs in academic institutions; and secondly, that many developing countries have reached a saturation point for their graduates to be absorbed by the public sector as extension agents, teachers, or entry level research assistants.

The program is simple, straight forward and easily adopted to specific situations. The program involves a commitment by the institution, special inputs and concern by key faculty, a small starter fund, basic facilities and land, and, of course; a student who wants to be better prepared for survival in agricultural business after graduation.

By the fourth year, most agricultural students has been exposed to the basic production and marketing concepts in their field, but few have had the responsibility of putting all of this background into a useful money making operation. The Student Enterprise Program (SEP) provides the student an opportunity to plan, budget, implement, produce, provide protection for, harvest, prepare the market for the commodity, and prepare the commodity for the market in a business-like manner. Many colleges have found the SEP to be so productive that they have made this a fifth year program.

The first step if for the student and his faculty advisor to decide on the commodity, which of course must fit into the academic year (or slightly longer). the animal science students usually select poultry (broiler or Egg production, hog raising, rabbit, fish or laboratory animals. the crops students usually select one of the high value vegetables, seedling plant production or fast growing nursery crops.

The student then prepares a production plan, a list of inputs needed, estimates of land, facilities and labor needed, and a very careful budget. Preliminary consideration of a market target is also made at this time. Once the plan and budget are approved by the College SEP Committee, the student embarks on his or her real life enterprise training. Record keeping is stressed and its importance to determining net profit and helping to establish a credit relationship with a lending institution for future reference becomes woven into the fabric of the day to day operation.

Hopefully, the SEP student is able to repay his or her loan, realize a profit, and gain an intimate knowledge of how the business side of agriculture works. With his careful record of operations, along with the record of input cost and net profit the student is able to show the commercial world that he understands the importance of careful planning, good management, hard work and that special courage required to run your own business.

APPENDIX E, Section 10

Figures Indicating Relative Importance of Crops and of Agricultural Research

Institute	Total Scientific Staff	Ph.D.	M.Sc.	B.Sc.
BARC	60	13(21.7)	34(56.7)	13(21.7)
BARI	560	45(8.1)	351(62.6)	164(29.2)
BRRI	236	26(11.2)	145(62.2)	65(27.9)
BJRI	158	13(8.6)	112(73.7)	33(2.17)
BINA	49	8(16.3)	9(18.4)	32(65.3)
BFRI (FOR)	92	8(8.8)	62(68.1)	22(24.2)
FRI (FISH)	67	5(7.5)	62(92.5)	-
BLRI	29	8(30.8)	19(73.1)	2(7.7)
SRTI	71	9(12.8)	41(57.4)	21(29.8)
SRDI (SOIL)	56	NA	-	-
TRI	28	2(7.7)	24(84.6)	2(7.7)

Source: Peter Oram (1989), "Evaluation of the Agricultural Research System in Bangladesh: Current Structure, Future Challenges, and Proposals for Meeting Them" in ASR, Bangladesh Agriculture - Performance and Policies compendium volume V UNDP, Bangladesh.

Note: Figures in parentheses indicate percentage in total.

Scientists by Research Institute In 1990 Numbers

Total Scientific Staff	Ph.D.	M.Sc.	B.Sc.	Other
102	26(25.5)	54(52.94)	19(18.63)	3(2.9)
467	58(12.4)	299(64.0)	110(23.55)	0
210	36(17.14)	125(59.52)	49(23.33)	0
147	18(12.24)	79(53.74)	50(74.01)	0
51	10(19.6)	32(62.75)	9(15.63)	0
64	6(9.38)	48(75.0)	10(15.63)	0
82	8(9.76)	51(62.20)	23(28.05)	0
37	9(24.32)	16(43.24)	12(32.43)	0
79	5(6.33)	35(44.30)	39(49.37)	0
77	0(0.0)	59(76.62)	18(23.38)	0
21	2(9.52)	18(85.71)	1(4.76)	0
1,337	178(13.3)	816(61.03)	340(25.4)	3(.2)

Source: Human Resources Study, Annex A, B, C and Narrative Report BARC/ISNAR.

Note: Figures in parentheses indicate percentage in total

Yield per Acre of Cereals in Bangladesh 1981-1990

Year	Aus	Aman	Boro	All Rice	Wheat
1981	11.50	14.30	24.60	14.60	20.00
1982	11.30	13.00	26.20	13.10	19.60
1983	10.50	13.80	26.80	14.60	22.90
1984	11.10	14.30	25.90	14.53	25.0
1985	10.35	14.97	26.85	14.64	23.41
1986	10.73	15.40	26.02	15.72	20.93
1987	11.60	14.86	26.02	15.72	20.28
1988	11.52	15.0	26.5	16.10	19.01
1989	11.52	15.0	24.10	16.60	19.82
1990	11.72	17.13	27.10	18.18	22.76

Source: R.E. Navin R.I. Khalil - The Agricultural Sector in Bangladesh - a Database, USAID, 1988 BBS, GOB - Monthly Statistical Bulletin of Bangladesh; various issues.

Annual Growth Rate of Area, Yield and Production of Cereals in Bangladesh: 1975-76 to 1986-87

Crop	Area	Production	Yield
Aus	-1.19	-0.55	.64
Aman	.34	2.08	1.16
Boro	4.99	7.54	2.55
All rice	.43	2.28	1.85
Wheat	14.50	16.69	2.19
Rice and Wheat	.89	2.86	1.97

Source: Agriculture Sector Review, UNDP/GOB, 1989

Some Planned and Actual Performance Targets of
Key Agricultural Commodities, Bangladesh

A. Non Cereal Crops

	Unit	SFYP Target (1984-85)	Actual	Target	TFYP Actual (1987-88)
Jute	000 tons	1.6	1.2	3.0	0.9
Potato	Mil tons	1.4	1.3	1.4	1.2
Sugarcane	Mil tons	7.8	7.0	n.a	7.5
Cotton	000 bales	56.0	12.0	100.0	31.0
Pulses	Mil tons	0.4	0.2	0.3	0.3
Oilseed	Mil tons	0.4	0.3	---	0.3
Tea	Mil Kg	37.5	38.2	40.3	52.7
Tobacco	000 tons	---	49.0	60.0	67.0
Vegetables	Mil tons	1.4	---	---	---
Fruits	Mil tons	0.9	---	---	---

B. Dairy, Poultry & Eggs

Item	Target	Achievement	%
Milk (000 mt)	1390	1326	95
Meat (000 mt)	480	435	91
Eggs (crore no.)	30	22	73

C. Fish, Marine

Item	Target	Achievement	%
Inland Fisheries	772.4	612.5	79
Ponds	192.0	161.0	84
Baors	2.8	1.5	57
Coastal Aquaculture	34.2	27.0	79
Rivers and estuaries	250.4	190.0	76
Beels and Haors	75.0	50.0	67
Kaptai Lake	8.0	5.0	63
Floodplains	210.0	178.0	85
Marine Fisheries	228.0	234.5	103

Source: Fourth Five Year Plan, 1989/90, Government of Bangladesh

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Agricultural Commodity	Total Value Products Mil Taka/86(1)	Percent Share of Total Value	Number of Scientists Involved (2)	Percent Share of Scientists Involved
Rice	108,890	48.41	238	26.09
Wheat	4,962	2.21	17	1.87
Other Creates	141	0.06	12	1.31
Other Food Crops				
Fruits	9,305	4.14	21	2.30
Oil seeds	2,344	1.04	26	2.85
Pulsar	3,716	1.65	9	0.99
Spices	3,116	1.39	NA	
Sugarcane	5,225	2.32	73	8.01
Vegetables	3,471	1.54	36	3.94
Potato	3,013	1.34	26	2.85
Cost Crops				
Tea and others	3,172	1.41	32	3.52
Fiber Crops	10,756	4.78	163	17.87
Livestock	31,594	14.05	75	8.22
Forest Food	18,263	8.12	92	10.09
Fisheries	16,927	7.54	92	10.09
Total	224,895	100.00	912	100.00

1. From Agriculture Sector Report UNDP 1990.
2. From Agriculture Sector Review USAID 1989.

Distribution by Funding Institution and by Sub-Sector, Bangladesh, Millions of Taka, 1989 - 1990.

Donor	No. of Projects	%	Project Cost* (in million Tk)	% of Total Cost
1. UNDP/FAO	32	29	510.12	16.3
2. Ford Foundation	11	10	152.89	4.9
3. USAID	5	5	573.40	18.4
4. ADB	12	11	156.87	5.0
5. IDA/World Bank	11	10	375.96	12.0
6. Others	39	35	1,352.22	43.3
Total	110	100	3,121.46	100.0

* Reflects total cost of projects with TA component

Subsector	No. of of TAS	%	Project Cost* (In Million)	% of Total
1. Crops	72	65.45	2518.45	80.68
2. Forestry	11	10.00	262.38	8.41
3. Fisheries	17	15.45	265.43	8.50
4. Livestock	10	9.09	75.20	2.42
Total	110	100	3121.46	100

* Reference total cost of projects with TA components

Source: Study for Evaluation and Improvement of Technical Assistance In Bangladesh, 1990, UNDP Bangladesh Project Management Institute.

ARP-II Target and Achievement on Training as of June 1991

Training (1)	Planned Slots (2)	Awarded (3)	Under Training (4)
Ph.D. (foreign)	16	16	10
Ph.D. (local)	29	27	18
M.S. (local)	30	22	15
Short term Training (foreign)	47		
Workshop/Seminar/Study Tour	40		17

Source: Internal Analytical Review of ARP II(S), BARC 1991; BARC Training Wing.

Technical/Scientist Ratio in the NARS in 1977/88

Institute	Technician/Scientist Ratio
BRRI	0.42
BINA	1.04
BFRI	0.23
LRI	0.34
Total	0.51

Changes in NARS Bangladesh Institutional Roster during Past 5 Years Scientist Listed

		1986-87	1990
Bangladesh Agricultural Research Council	BARC	50	102
Bangladesh Agricultural Research Institute	BARI	557	467
Bangladesh Rice Research Institute	BRRI	191	210
Bangladesh Jute Research Institute	BJRI	120	147
Bangladesh Forestry Research Institute	BFRI	77	64
Fisheries Research Institute	FRI	41	82
Bangladesh Institute of Nuclear Agriculture	BINA	48	51
Bangladesh Livestock Research Institute	BLRI	8	37
Bangladesh Tea Research Institute	BTRI	28	21
Sugar Cane Research & Training Institute	SRTI	48	79
TOTAL		1,168	1,337

Source: Human Resources Study, BARC, 1990, Dhaka.

APPENDIX E, Section 11

Recommended Rice Varieties Released from BRRI

Sl. No.	BR No.	Popular Name	Season	Year of Release	Maturity (days)	Yield	Remarks
1.	BR 1	Chandina	Boro	1970	145-150	4.5-5.5	
			T.Aus		115-120	3.5-4.5	
2.	BR 2	Mala	Boro	1971	150-160	5.0-5.5	
			T.Aus		120-125	4.0-4.5	
3.	BR 3	Biplab	Boro	1973	165-170	5.5-6.5	
			T.Aus		125-130	4.5-5.0	
			T.Aman		140-145	4.5-5.0	
4.	BR 4	Brrisail	T.Aman	1975	145-150	5.5-6.5	
5.	BR 5	Dulabhog	T.Aman	1977	140-150	2.5-3.0	Scented
6.	BR 6	Dulabhog	Boro	1977	135-140	4.0-4.5	
			T.Aus		105-110	3.0-3.5	
7.	BR 7	Brribalam	Boro	1977	140-155	4.0-4.5	LS grains
			T.Aus		115-130	3.0-3.5	
8.	BR 8	Asha	Boro	1978	155-160	5.0-5.5	
			T.Aus		120-125	4.0-1.5	
9.	BR 9	Sufala	Boro	1978	150-155	5.0-5.5	
			T.Aus		115-120	4.5-5.0	
10.	BR10	Pragati	T.Aman	1980	145-150	5.5-60	
11.	BR11	Mukta	T.Aman	1980	140-145	5.5-60	
12.	BR12	Moyna	Boro	1983	165-170	4.5-5.5	
			T.Aus		125-130	4.0-4.5	
13.	BR14	Gazi	Boro	1983	150-160	5.0-6.0	
			T.Aus		115-120	4.0-5.0	
14.	BR15	Mohini	Boro	1983	160-165	5.0-5.5	
			T.Aus		120-125	4.0-4.5	
15.	BR16	Shahibalam	Boro	1983	160-165	5.0-6.0	LS grains
			T.Aus		125-130	4.0-4.5	
16.	BR17	Hashi	Boro	1985	150-155	5.0-5.5	Low lying Boro areas only
17.	BR18	Shajalal	Boro	1985	165-170	5.0-5.5	"
18.	BR19	Mangal	Boro	1985	165-170	5.0-5.5	"
19.	BR20	Nizami	Upland Aus	1986	110-115	3.0-3.5	Direct seeded
20.	BR21	Niamat	Upland Aus	1986	100-105	2.5-3.0	Direct seeded
21.	BR22	Kiron	T.Aman	1988	130-150	4.5-5.0	Potato period sensitive and suitable for late planting
22.	BR23	Dishari	T.Aman	1988	130-150	5.0-5.5	"

Percentage of Modern Varieties (MV) of Rice Planted by Season in Bangladesh

Percentage of MV Area by Variety

	T.Aman	BRRI Varieties	Aus
BR1			
BR2	0.43	3.50	20.15
BR3	1.14	1.50	1.12
BR4	8.56	19.30	6.21
BR5	0.81		0.58
BR6		0.30	
BR7		1.90	
BR8	1.01	0.50	8.22
BR9	0.01	5.00	5.03
BR10	5.33	1.20	
BR11	63.03	6.50	0.40
BR14	2.50	8.80	8.84
BR16		0.10	
BR17		0.10	
BR18		0.40	
BR19		0.30	
BR20			0.97
BR22	0.05		
BR23	0.07		
	Varieties Introduced by BRRI		
IR8		11.70	5.06
IR5	1.25		
IR20	0.78		0.06
PURBACHI		21.10	34.08
IR50		2.20	0.87
IR76		0.40	

Varieties from Other BINA and BAU

IRATOM	4.00	0.79
BAU 63	0.20	

Varieties Not Introduced by BRRI

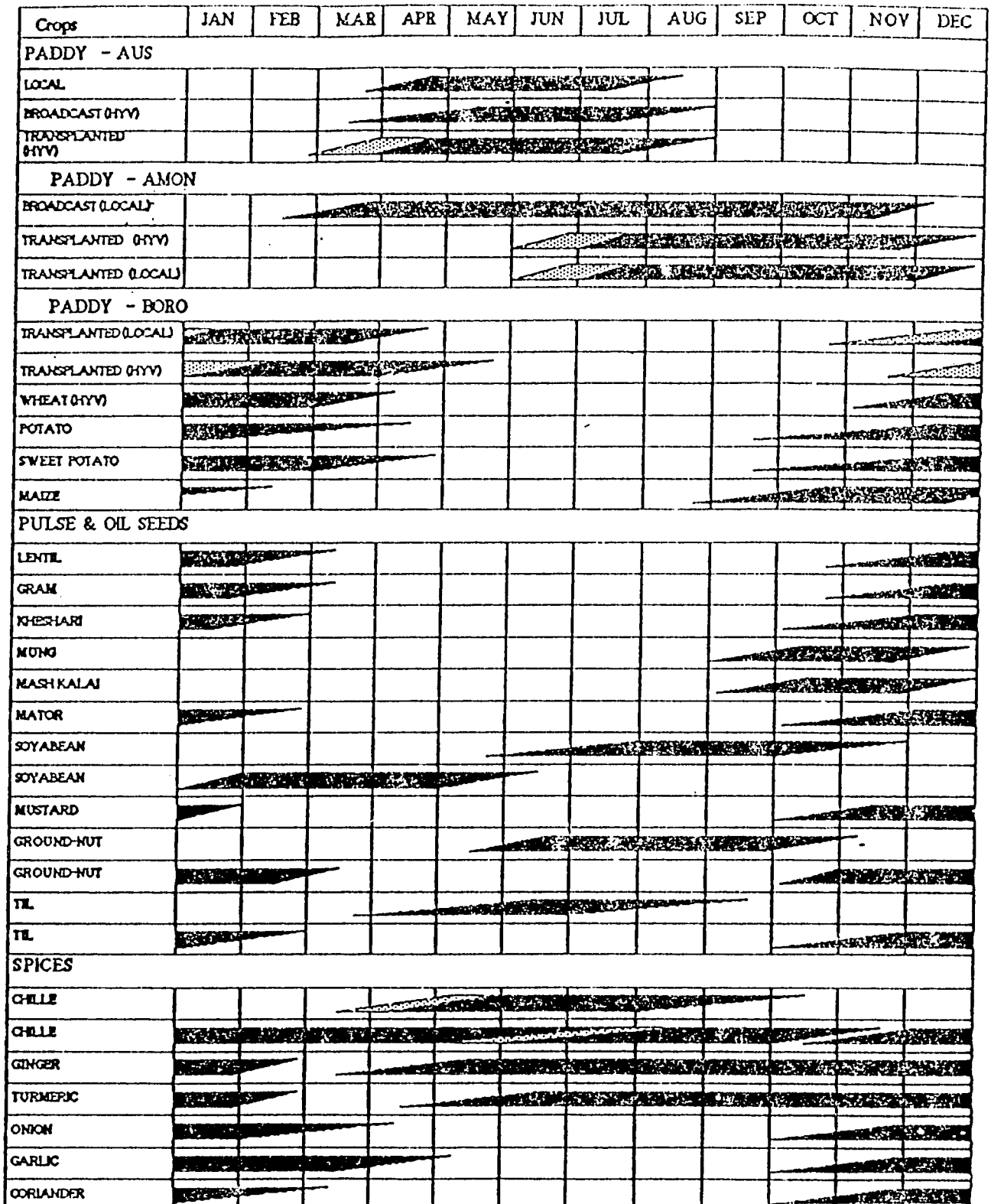
PAJAM	14.53	4.80	0.13
INDIAN	0.50	5.50	6.62

MVs and Local Varieties as % of Total Area by Season

	Aman	Boro	Aus
BRRI (1981-1990)	1	8	2
BRRI (1970-1980)	35	35	10
IRRI	1	12	1
Pajam	6	4	
Purbachi		18	9
Indian	1	6	7
Local	57	13	75

Source: BRRI Economics Dept. Annual Report, 1991

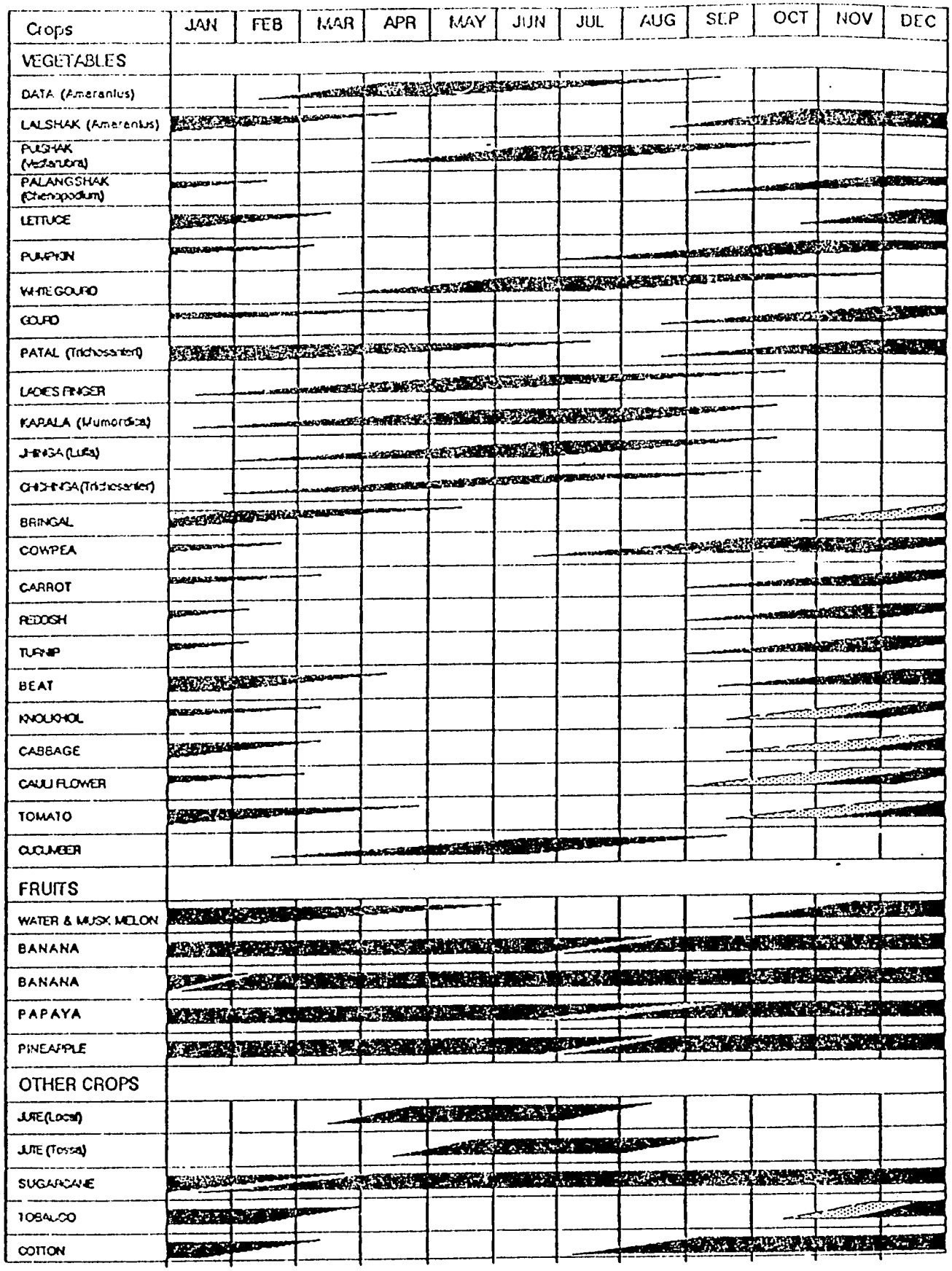
APPENDIX E, Section 12
Crop Calendar of Bangladesh



EXISTING CROPPING PATTERNS:

1. AUS / JUTE . T.AMAN
2. AUS . T.AMAN . KHESARI (LATHYRUS)
3. JUTE . KALAI (PULSE)
4. AUS AND T.AMAN
5. AUS . MUSTARD /PULSES/RABI VEGETABLES/ TOBACCO/COTTON/POTATO
6. AUS AND ARHAR (CAJANUS)/TIL (SEASAME) MIXED
7. B AMON
8. AUS AND B. AMAN MIXED
9. BORO
10. SUGARCANE
11. SUMMER VEGETABLES . MUSTARD/PULSES

= Seed Bed
(HYV) = High Yield Variety



Data Source: Navin Jr. R.E. and Khalil M.I. 1989: The Agricultural Sector in Bangladesh – a Database, U.S. Agency for International Development, Dhaka, Bangladesh, Revised, July, 1989, P. 44.

Maximum and Minimum Temperature at Selected Centres

Centre	1985		1986		1987		1988(P)	
	Max.	Min.	Max.	Mln.	Max.	Min.	Max.	Min.
Chittagong	34	10	35	12	34	15	39	14
Chittagong H.T.	36	13	37	13	34	14	35	15
Noakhali	36	11	37	11	34	14	36	11
Comilla	36	10	37	10	34	13	37	11
Sylhet	36	10	37	11	32	12	36	13
Dhaka	38	11	40	11	35	13	39	14
Faridpur	38	11	41	11	35	12	41	13
Mymensingh	35	10	36	11	32	13	41	13
Barisal	37	10	38	10	34	12	37	12
Jessore	41	10	40	9	36	11	41	11
Khulna	39	8	39	8	36	11	39	12
Patuakhali	36	12	37	11	34	14	36	14
Bogra	40	9	40	10	34	12	38	12
Dinajpur	39	7	41	9	34	11	40	12
Pabna	43	8	42	8	37	12	37	12
Rajshahi	44	8	42	8	37	11	42	11
Rangpur	37	9	39	9	33	11	38	12

Source: Meteorological Department

Monthly Rainfall of Selected Cities

(in millimeters)

Year/Month	Dhaka	Chittagong	Khulna	Rajshahi	Sylhet	Rangpur
1988(P)						
January	--	--	--	--	--	--
February	44	35	50	28	97	31
March	73	106	18	10	85	28
April	262	213	53	109	297	165
May	524	262	270	105	1,160	186
June	571	550	418	516	909	299
July	270	776	366	359	580	604
August	169	420	302	358	1,184	633
September	196	314	68	89	758	496
October	21	371	95	89	60	19
November	na	na	na	na	na	na
December	na	na	na	na	na	na
TOTAL	2,130	3,047	1,640	1,663	5,130	2,461

Source: Meteorological Department

Land Utilization Statistics
(Area In 000's acres)

	Not Available for Cultivation	Forest	Cultivat -ible Waste	Current Fallow	Single Cropped Area	Double Cropped Area	Triple Cropped Area	Net Area Shown	Total Cropped Area (Co.6x1) + (Col.7x2) + (Col.8x3)
1	2	3	4	5	6	7	8	9	10
1981-82	6837	5298	611	1350	11464	8070	1678	21212	32637
1982-83	6876	5296	572	1196	11346	8285	1733	21369	33130
1983-84	7156	5205	810	1125	11430	8453	1559	21442	33013
1984-85	7193	5297	721	1221	11682	8199	1472	21353	32496
1985-86	7220	5237	670	997	11516	8492	1653	21661	33459
1986-87	8141	4910	660	973	10781	9189	1908	21878	34883

Source: Agricultural Statistics Wing, BBS.

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APPENDIX E, Section 13

Results of Evaluation Team Mini-RRA of Research/Extension Professionals in Bangladesh

June 16-21, 1991
Rajshahi Region (Rajshahi and Ishurdi Districts)
Sample size = 11 senior officers

SELECTED RESULTS OF MINI-RRA

ARI	Number	Post	Number	Overall Impression of FSR	Number	Respondent's Gender	Number
BARI	5	SO	2	Excellent		Male	10
BRRI	4	SSO	5	Good	5(*)	Female	1
DAE	1	PSO	0	Average	1		
IRRI	1	CSO	2	Poor	1(*)		
				Useless	0		

(*) One respondent provided two different scores for FSR: a "good" for the approach and a "poor" for the technology transfer aspects of it.

THE "MOST VALUABLE" COMPONENTS OF THE FSR APPROACH ARE

COMMENT:	NUMBER
Crop component research or good varieties	3
Greater awareness of farmer problems	3
Local adaptation of station-developed materials	2
Researchers working with farmers	1
Better linkages with the extension service	1
On-station research doesn't reveal all problems	1
Greater respect is paid to farmer's technologies	1
Field research team works well together (teamwork)	1
Problems identified from many view points (multidisciplinarity)	1
TOTAL	14

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THE "LEAST VALUABLE" COMPONENTS OF THE FSR APPROACH ARE

COMMENT:	NUMBER
Improved logistical support/more vehicles needed	6
Isolation of work/posting is not enjoyable	4
Weak links with extension (*); no "TOT" mechanism exists	3
A huge amount of data is collected & poorly managed/not analyzed	2
Neglecting traditional research/too much emphasis on FSR	1
Station technologies come forward too slowly for rapid FSR approach	1
Farmer problems are identified but not fed back to research	1
On-farm trial results are not being interpreted	1
On-farm results are not being extrapolated to similar AEZs	1
Recommendations from FSR change too frequently (year to year)	1
Management of technologies is weak or missing	1
Insufficient manpower to gather farmer impressions during FFDs	1
HVPP-like programs fail when funding support is withdrawn	1
Agroforestry trees will shade out vegetables in HVPPs	1
Fish-cum-poultry model, even in Philippines, remains just a model	1
Bamboo-penned poultry component is too expensive for rural poor	1
TOTAL	27

(*) The extension service will not extend the mature cropping pattern Green Manure-T. Aman in the Rajshahi Region.

Use of RRA in FSR-Assisted Research and Extension Priority-Setting

A difficulty in FSR is always how to involve extension. How are research efforts moved efficiently from research to extension? This is particularly true here in Bangladesh, where FSR sites have gradually evolved into "mini-substations" and have not been "turned over" to extension. Another difficulty in FSR is for practitioners to determine, articulate, then incorporate, farmer-identified problems into their priorities, then move their priorities from the local or regional level, through the annual work plan approval process, higher up in the MOA.

The combination of (1) an on-going FSR approach, (2) a tool of RRA, and (3) judicious use of a laptop or a notebook computer, can provide programs with a solution to both problems.

The method consists of two general conceptual steps:

1. Incorporating farmer opinion into annual research and extension work plans.

2. Prioritizing local and regional research and extension activities.

The ISNAR representative of the ARPII (Supplement) has facilitated development of a national-level agricultural research prioritization model. This model combines a scoring method with an economic surplus method, and data for it were collected from ARIs (Analysis of Agricultural Priorities in Bangladesh [preliminary draft], 1990). This model works from the top down, as does everything else in Bangladesh, incorporating national plan objectives as criteria.

What is also needed is a similar mechanism for local and regional prioritization. Since Bangladesh is now moving toward client-responsive agricultural research, it is only natural that farmer opinions, opportunities and problems should help drive the research and extension prioritization process. This appendix will provide guidance for the data required, and the steps needed, to do this in the Bangladesh context.

Overview of local level research and extension prioritization:

FSR approaches in Bangladesh currently interview farmers to elicit their problems. These problems are also prioritized (ranked), sometimes into four categories of priorities (FSR: Mohammad, 1990; pp. 43-45). These problems are used to assist OFRD teams plan future research activities. However, there is no agreed-upon process for (1) verifying

these ranked problems with farmers, (2) providing a file copy record for the proposed solutions to these problems, or (3) incorporating these priorities, and the resulting solutions, into annual work plans at the regional, then national, level.

Use of a RRA tool, laptop or notebook computers, and joint farmer-extension-researcher meetings can systematize this prioritization process and, at the same time, allow farmer clients to assist the NARS set both research and extension priorities.

The process can be described in brief steps as follows:

STEP 1 (FARMER INVOLVEMENT)

A farmer meeting is called (for a given AEZ).

Based on the previous RRA (or pooled knowledge) for the AEZ, the socioeconomic staffs prepare flip-chart sized sheets of paper containing lists of predominant farmer problems, by season (Aus, Aman, Boro) and by pattern.

A laptop or notebook computer[11] is used to enter these problems as alternatives in the software program Decision Pad.[12]

Appropriate representatives from headquarters, regional stations and substations, and the DAE are invited to join the farmers in a joint meeting.

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[11] If unavailable, a desktop model can be used. Then the FSR team will need to set up and carry out two farmer meetings: (1) the first to elicit and update a current set of problems, and collection of farmer's votes, and (2) the second to feed back to the farmers the results of the prioritization exercise and confirm the ranked priorities with them.

[12] Decision Pad is a program invented expressly to facilitate making difficult group decisions. It is used (1) to set up a farmer opinion file, (2) for data entry (summarizing farmers' predominant problems), and (3) to assist field-level teams re-prioritizing these problems. The same program is used in the second step, with a different set of templates, to assist in prioritizing research and extension activities proposed at the local and regional levels.

Decision Pad is a spreadsheet-type computer program which is designed to help busy professionals make difficult group decisions more logically and more easily. It takes the form of a three-dimensional spreadsheet (see diagram, "Visual model of Decision Pad", next page). It allows you to specify as many as 250 "alternatives" for any decision. Decision Pad then allows you to define up to 250 "criteria" for evaluating the alternatives for this same decision. Finally, it allows up to 60 individuals to vote on, or "evaluate", these alternatives using the criteria. In agricultural development, the "evaluators", or voters, are first farmers, then researchers and/or extension agents.

The flip-chart sheets of problems are displayed during the group meeting, a facilitator reads through for clarification, and the whole group discusses just what is meant by each problem.

The group eliminates any problems judged to be no longer of any significance.

The whole group is polled as to additional problems, and the facilitator (or an assistant) adds them to the lists.

Again the facilitator stimulates discussion so that the new problems are clearly understood by the joint participants.

All farmers vote for their top 3 (or 5, or any arbitrary number, to be set for Bangladesh conditions) of problems, by season and pattern within season.[13]

All ballots are collected, and the socioeconomists from the FSR team, assisted by those from headquarters, uses the laptop or notebook computer to enter the data into Decision Pad while the rest of the group eats lunch.

Following data entry, the farmer-identified problems are ranked automatically by the program (using a combined response frequency by score calculation).

A hard-copy printout is produced after the automatic analysis update (it helps to have a portable, battery-operated printer and connector cables along with the computer).

Using the printout of farmer priorities, the flip-chart lists are updated with farmer-ranked problems.

These rankings are again discussed with farmers after lunch, to verify the results in their eyes.

[13] Given that 80% of the farmers are likely to be illiterate, the ARI research representatives and the DAE representatives assist them in this exercise by repeating the list of problems to each individual farmer and recording his or her response as to the worst problem, the second worst problem, etc.

Step 2 (Research-Extension Prioritization)

Forms are developed for putting forward proposed research or extension activities (a sample form, developed for, and used in, the NARS of Jordan, is attached for both research and extension prioritization).

It is essential that the MOA, from the BARC to each regional ARI substation, agree on both the criteria and weights given to prioritize potential research and extension activities.[14]

Local and/or regional researchers and extension agents meet together to formulate next year's (or next season's) work plan.

The farmer-identified and ranked problems from the previous meeting are separated into these three groups:

1. Research Activity List: Contains those problems appropriate for station- or farm-level research trials (e.g., the group agrees that (a) no solution yet exists, or (b) the tentative solution(s) still need to be locally verified through farm-level trials).

2. Extension Activity List: Contains those problems appropriate for extension solutions (e.g., the group believes that existing technology which have been verified locally are ready for recommendation and dissemination).

3. Policy List: This list will contain those problems which do not fit on either list above: they are appropriate for neither research or extension, but are

[14] It will be necessary to hold a MOA-wide workshop, to which representatives from BLRI, FRI, BJRI and BAU are also invited, to propose, discuss, debate and agree upon one set of criteria for future research activities, one set of criteria for future extension activities, and the weighting system for each. The respective ARI Dgs, Directors of Research, all Heads of Divisions, and Heads of regional stations and substations must reach active agreement that such system is needed, or the exercise will not be worth doing.

Any process of assisted research and extension prioritization must be of perceived and active help to these decision-makers, not just another drain on their scarce time. For this reason, this process is incorporated directly into either an annual or a seasonal planning process which is already on-going. By complementing an existing planning process, this change in that process, to incorporate local priorities more explicitly, assists these scientists with the accompanying paperwork by providing quick justification and many parts of the required paperwork trail for the existing local and regional planning processes. Finally, this process should eventually fit right into the macro prioritization model already proposed for Bangladesh (Analysis of Agricultural Research Priorities in Bangladesh, 1990).

important enough to be forwarded on to policy makers at higher levels of the MOA.

A separate form will be used, and filled out, for each proposed research or extension activity (see samples).

An estimated cost is entered for each proposed activity.

As research or extension solutions are proposed for each "researchable" or "extendable" problem, the score entered into the slot on the form for "farmer acceptability" is the average score given it by the farmers in that AEZ.

The rest of the scores (for the rest of the agreed-upon criteria) are either filled in now, or are filled in later (at the regional station or back at the ARI headquarters), depending on the time constraint.

Once all scores have been entered, each commodity or service program staff enters the results into the computer (again using Decision Pad), and overall scores are generated for each proposed activity.

The overall score of the proposed activity is entered into the last space on its form.

The forms are placed in a stack, with the proposed activity which received the highest score going on top, and the form receiving the lowest priority going to the bottom of the stack.

Now the local or regional work plan is put together automatically, with perspective activities being listed sequentially by priority, from highest to lowest.

While putting together the work plan, a staff member keeps a running tally of cumulative estimated costs.

If the operating budget for the next season or year is known, the plan is continued until the division, department or station head exhausts the budgeted funds on proposed research or extension activities. At this point, by definition, the prioritization activity is finished and, by default, also the work plan.[15]

If the operating budget is not yet known, the list is continued until all activities have been

[15] A division, section, unit or station head may wish to under-spend his or her budget by some proportion, say 10-20%, to allow for cost overruns and/or other contingencies and unexpected surprises.

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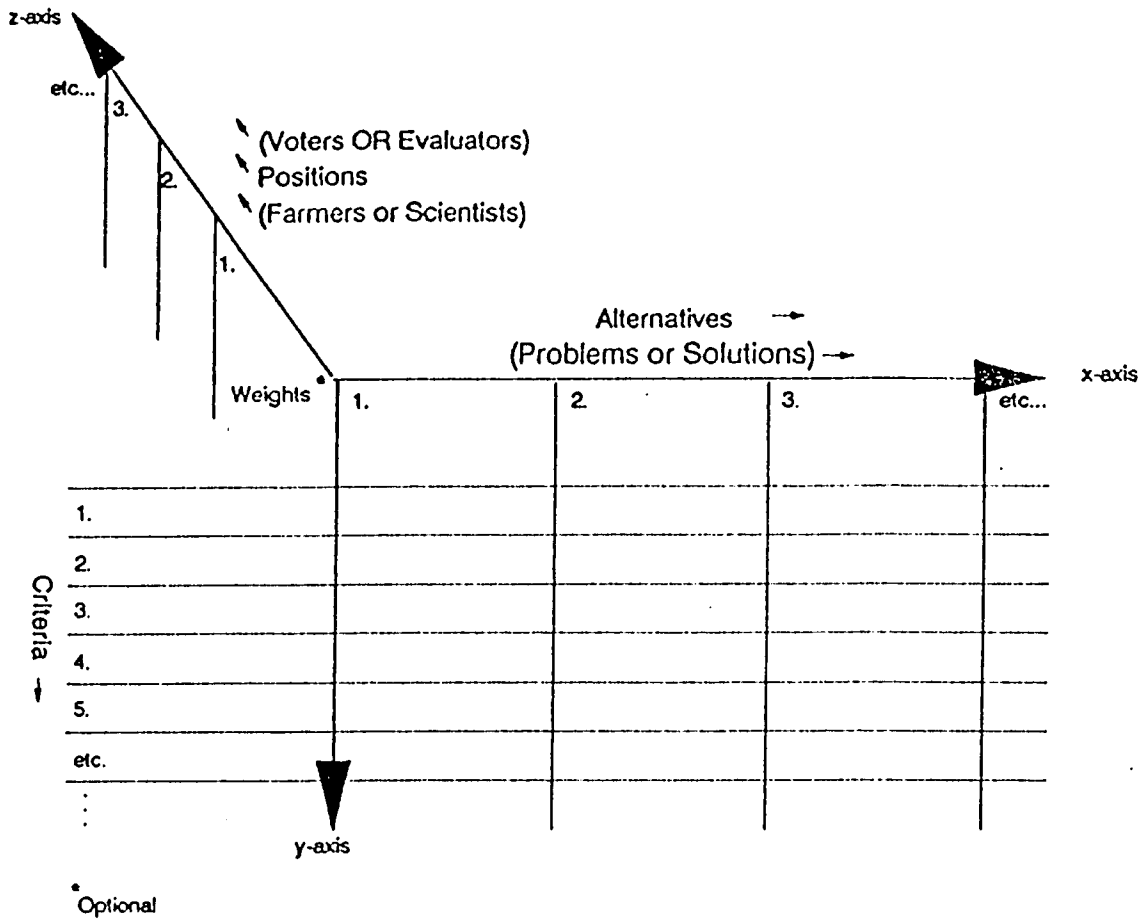
added to the work plan, and all estimated costs tallied. Then, as soon as the operating budget becomes known or is released, the head of this division, department or station will have to go back and locate the cut-off point, below which no research or extension activities can be funded (essentially, repeat the previous step).

Visual Model of Decision Pad



Decision Pad revolves around these three interactions:

1. X-axis = = > **"Alternatives"** = = > may be thought of as either a set of "problems" identified by farmers, or "solutions" to these problems.

2. Y-axis = = > **"Criteria"** = = > may be thought of as a set of items against which you evaluate the "alternatives" to make an important decision.

3. Z-axis = = > **"Evaluators"** = = > may be thought of as those who vote on any decision, using the set of agreed-upon criteria to evaluate the list of alternatives (they may be farmers, researchers, or extension agents).

To visualize what Decision Pad does, think of your alternatives as being spread along the X-axis, your criteria being spread along the Y-axis, and your voters being spread along the Z-axis. Each "vote" is tallied by multiplying it against the weight given to the criteria; each "alternative" is ranked by the sum of all these weighted votes against each criterion and across the whole set of criteria.

APPENDIX F
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APPENDIX F

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Magallona, Edwin D. nd6. Short-term Expatriate Consultant in Insect Population Modelling. 7 pp.

Magallona, Edwin D. nd7. Short-term Expatriate Consultant in Plant Disease Identification and Operation of a Pest (Disease) Diagnostic Clinic. 4 pp.

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APPENDIX G

Schedule of Interviews and Visits 26 May - 14 July 1991

26 May Sunday	Team Leader, George A. Marlowe arrived Dhaka 1500 Hrs.
27 May Monday	Pre-conference with USAID office of Food and Agriculture Program Specialist Latifur Rahman at American Embassy, Dhaka.
28 May Tuesday	Conferences with USAID Office Food and Agriculture Director, Donald G. Brown, Deputy Director Helen K. Gunther, and Project Officer Raymond H. Morton.
29 May Wednesday	Conference with USAID Program Office, Evaluation Specialist Anne Schwartz. Conference with Dr. A.K.S. Huq, President, House of Consultants Ltd. Conference with Dr. S.M. Hasanuzzaman, Retired D.G., Bangladesh Rice Research Institute and Member, Planning Commission, Mr. S.A. Wahed, Retired District Extension Director Agricultural Extension Service and Dr. Ashraf Chowdhury, Professor of Economics, University of Dhaka (Selection of Local Team: Dr. Chowdhury, Mr. Wahed). Conference with Kenneth L. Moots, Chief of Party, International Fertilizer Development Center Team FDI Project I, Dhaka.
30 May Thursday	Conference USAID office of Food and Agriculture, Project Officer Dr. Raymond H. Morton, Dr. Carl Pratt Evaluation Team Member arrives 1300 Hours. Conference G. Marlowe, Carl Pray and Dr. A.K.S. Huq, House of Consultants Ltd. Conference with Dr. M.V. Gupta, Aquaculture Specialist, ICLARM.
1 June Saturday	Conference with Dr. M.S.U. Chowdhury, Executive Vice Chairman,BARC Mr. Abdun Nur, Director, Agric. Information Center Dr. Yousuf Mozumder, Director, Technology Transfer Monitoring Unit. Mr. M. A. Hanif, Director, Finance.
2 June Sunday	Conference with BARC Secretariat, Member Directors and Directors: Dr. A.K.M. Nuruzzaman, M.D., Fisheries Dr. M.A. Hamid Miah, M.D., Planning and Evaluation Dr. G.M. Shahjahan, M.D., Agricultural Engineering Dr. S.M. Elias, M.D., Agric. Econ. and Rural Sociology Mr. Ahmed Hossain, Director, Training. Dr. Aurangjeb, M.D. Corps, 5.N.H.

APPENDIX G

Schedule of Interviews and Visits Including
Persons/Agency Representatives Interviewed

3 June Monday	Conferences with Dr. Kazi M. Badruddoza, Consultant United Nations Agencies, BARC Conference with Dr. Bruce Currey, Representative, Winrock International, Dhaka.
4 June Tuesday	Conferences with Specialists in ARPIIS, Dhaka Dr. Robert E. Witters, Senior Research Management Specialist ISNAR Dr. M.V. Gupta, Aquaculture Specialist, ICLARM Dr. Jerry L. McIntosh, Team Leader, IRRI Contingent Dhaka. Dr. M.L. Chadha, Vegetable Horticulorist, AVRDC
5 June Wednesday	Conferences with Checchi Specialists, Steel Building, Dhaka. Dr. Joseph J.C. Madamba, Chief of Party * Dr. Eduri D. Magallona, IPM Specialist Dr. Rudy N. Mallick, FSR Specialist Dr. Ali Mohammad, Agric. Economics Specialist Mr. Kenneth D. Sivarn, Communications Specialist Dr. Thomas E. Morgan, Planning and Evaluation Specialist Dr. Louis T. Palmer, Research Facilities Specialist. Dr. Noazesh Ahmed, Media Materials Production and Dr. Kamaluddin Ahmed FSR Technology Packaging * Dr. Joseph J.C. Madamba also serves as Human Resources Development Specialist and Livestock Adviser.
6 June Thursday	Conferences at BARI, Joydebpur. Dr. M.H. Mondol, Director General Dr. Moniruzzaman, Director of Research Dr. M. Zainul Abedin, Head On-Farm Research Division Dr. Shahidul Islam, Head Soil Science Division. Dr. Hamizuddin Ahmed, Head Plant Pathology Division Dr. Mohd. Abdul Karim, Head Entomology Division Visits to laboratories in Entomology, Plant Pathology, Soils and Vertebrate Pest Control.
7 June Friday	Conferences with Dr. Kenneth Mackay, Director General, ICLARM and Dr. M.V. Gupta, ICLARM Aquaculture Specialist.
8 June Saturday	Conferences at BRRI, Joydebpur. Dr. Azizul Islam, Director General Dr. N.M. Miah, Head Plant Breeding Division Dr. A.N.M. Rezaul Karim, Head, Entomology Division Dr. Nizam Uddin Ahmed, Head, Rice Farming Systems Visits to Germ Plasm Bank, Plant Breeding Laboratories and BRRI Farming Systems Research Site. Dr. Daniel L. Galt arrive, Dhaka 1400 Hours.

9 June Sunday	Conferences at USAID (Galt-Marlowe) with Food and Agriculture Office Director Donald G. Brown, Deputy Director Helen K. Gunther and Project Officer Raymond H. Morton In A.M., Conferences with House of Consultants Ltd. President In afternoon. Conferences with Jute Research Institute, Livestock Research Institute (Dr. Pray, Dr. Chowdhury and Mr. Wahed). Conference with Dr. Aminul Islam, D.G., BJRI Conference with Dr. Shamsul Haque, D.G., BLRI
10 June Monday	Conference Institute Development Studies BIDS (PRAY) Conference with Planning Commission Mr. Muhammed Sirajuddin, Member Conference with Helen Keller, International (Marlowe) Dr. Menno Hulder Nutrition Surveillance Project. Conference with Program Director, AVRDC, DRS Sundarsandarum and Dr. M.L. Chada Vegetable Specialist AVRDC-ARPIS.
11 June Tuesday	Conference Forest Research Institute, Chittagong Dr. A.B.M. Salhuddin, Director and Division Heads with Senior Staff (entire tour facilities, watch demonstration of bamboo seedling production and bamboo CCB penetration, procedure for preservation. Visit Forestry FSR Site with Dr. Rudy Mallick. Visit Regional Agricultural Research Station, Hathazari.
12 June Wednesday	Conferences with extension officers and farmers in cyclone disaster area of Anwara and Banskhali Upazilas enroute to Dhaka from Chittagong (11.5 hours journey).
13 June Thursday	Conferences with Checchi and USAID specialists.
14 June Friday	Conference with Deputy Director Office of Food and Agriculture Dr. Helen K. Gunther USAID, Dr. Kenneth L. Moots, Chief of Party, IDRC.
15 June Saturday	Conferences Bangladesh Agricultural University, Mymensingh. Dr. Mohammad A. Rahman, Vice Chancellor Horticulture Department Faculty Members Dr. A.H.M. Faruque, Dr. M.A. Siddique, Dr. Akbar Husain. (Marlowe), Pray conference Ag. Economics Deptt. Visits to seven Fisheries Demonstration ponds with Dr. M.V. Gupta Aquaculture Specialist ARPIIS.
16 June Sunday	Conferences at Fisheries Research Institute, Mymensingh. Professor M. Aminul Islam, Director and Research Demonstrations by senior staff on station. Conferences at BINA, Mymensingh. Dr. A.J. Miah, Director, Dr. M.A. Hossain, Department of Genetics and Plant Breeding, and Dr. A.H.M. Razzaque, Agronomy Division.

	Conference with World Bank Representatives (Pray) Dr. Ross Wallace, Frank Thornley and Hikomat Nasir.
17 June Monday	Group A (Marlowe, Chowdhury) Conferences Sylhet with Dr. Joseph J.C. Madamba Chief of Party, Checchi Team, Mr. Emdadur Rahman, Community Farming Services Group Chairman, Mr. Alim — President of New Engineering Works Ltd., Sylhet, Mr. Helal Uddin Chowdhury, Managing Director, Helal United Farm, Sylhet and entire CFSG farmers group. Visits to machinery manufacturing center, rice hull charcoal briquette making center, rice hull particle board making, integrated farms, fish ponds, vegetable farms, fruit production sites. Group B (Galt, Wahed) Enroute to Rajshahi Group C (Pray) Conferences with World Bank Representatives, Dhaka
18 June Tuesday	Group A (Marlowe, Chowdhury) Additional conferences Sylhet with Dr. Joseph J.C. Madamba, Mr. Emdadur Rahman, Mr. N.L. Das, Deputy Director of Extension Sylhet District, Mr. Alim Chowdhury, President New Engineering Works, Sylhet. Visits to Disaster Rehabilitation Project target area at Balagon Upazila; seed nursery, seed store and market operations of the Community Farming Services Group; small holder dairy and poultry operations. Group B (Galt, Wahed) Conferences Rajshahi with Dr. R.N. Mallick FSR Specialist and Dr. E.D. Magallona IPM Specialist, Checchi team, Dr. A.M. Musa Director On-Farm Research Department Barind Station and Mr. P.K. Kar Deputy OFRD officer at FSR Sites in Rajshahi area. Conferences with Institute of Biological Economics, University of Rajshahi Professors: Dr. M. Altaf Hossain, Genetics Dr. Nurul Amin, Tissue Culture Dr. M. Khalequzzaman, Toxicology Dr. M. Monjur Hossain, Biotechnology Dr. M. Gausuzzaman, Plant Pathology Dr. K.A.M.S.H., Mondal IPM Dr. M. Rashidul Haque, Biotechnology Group C (Pray) Conferences with BIDS and BARC Dr. S.M. Elias, M.D. Socio Economic Division

19 June Wednesday	Group A (Marlowe, Chowdhury) enroute Dhaka.
	Group B (Galt, Wahed) Conference Chapai-Nowabganj BARI Fruit Sub-Station Dr. Amjad Hossain, Head of Station, Dr. Mallick and Dr. Magallona
	Group C (Pray)
	Conference with Dr. Ali Mohammad, Agricultural Economist, Checchi Team and Dr. Mahahule Hussain, BIDS, Dhaka.
20 June Thursday	Group A and B, Conferences BARI Regional Agric Research Division, Ishurdi, with Dr. R.N. Mallick FSR Specialist Checchi and Dr. M.M. Rahman Director of BARI-RARS and Dr. W.A. Shah, Chief of On-Farm Research Division BARI Ishurdi.
	Group C (Pray) Conferences with Winrock Representatives, Dr. Bruce Currey, Dhaka
21 June Friday	Group A and B, Conferences SRTI, Ishurdi and visits to FSR sites BARI and SRTI.
	Conferences SRTI Director Ali Yasin, Dr. Ali Iman and Dr. Delwar Hossain, Head, Dept. of Agronomy SRTI and Dr. R.N. Mallick FSR Specialist, Mr. M.M.A. Karim, In charge, N.C. Basak and R. Yasmin Scientific Officer, OFRD, BARI; Mr. M.R. Saha, S.O. FRI, Ishurdi.
22 June Saturday	Conferences (Galt, Marlowe, Pray) with Winrock Representative Dr. Bruce Currey, Dhaka.
23 June Sunday	Manuscript Preparation
25 June Monday	Manuscript Preparation
26 June Wednesday	Team Conference at White House II, House 10 Road 62 Dhaka.
27 June Thursday	Preliminary debriefing by Team at USAID with Mission Director Dr. Mary C Kilgour, DD Dr. Ma.... J. Purvis, Dr. Helen K. Gunther DD Food and Agriculture Office, Dr. Ann Schwartz, Evaluation Specialist Program Section, Mr. Latifur Rahman Program Specialist OFA/USAID.
28 June Friday	Manuscript preparation. Conference with BARC, EVC Dr. M.S.U. Chowdhury, Full Team.

29 June Saturday	Manuscript preparation. Dr. Carl Pray departs 0200 Hours. Conference with permanent Secretary of Agriculture, Mr. K.M. Rabbini, Dr. Helen K. Gunther, Deputy Director Office of Food and Agriculture USAID Dhaka.
30 June Sunday	Conferences with Department of Agricultural Extension, Director General Mr. Shahidul Islam Conference with Dr. Mogen M. Dey BARC and Dr. Jerry McIntosh IRRI Representative (Galt).
1 July Tuesday	Conference BRRI Joydebpur with Dr. Jerry McIntosh IRRI Representative and FSR/BRRI Group (Galt) Conference with Dr. Joseph J.C. Madamba, Chief of Party, Checchi team.
3 July Wednesday	Manuscript preparation.
4 July Thursday	Evaluation Team Conference, Manuscript preparation
5 July Friday	Manuscript preparation
6 July Saturday	Evaluation Team Conference, Manuscript preparation
7 July Sunday	Evaluation Team Conference, Manuscript preparation
8 July Monday	Presentation of Evaluation Team Recommendations to BARC at USAID
9 July Tuesday	Evaluation Team Conference, Manuscript preparation
10 July Wednesday	Evaluation Team Conference, Manuscript preparation
11 July Thursday	Presentation of Draft to USAID, OFA and Program staff
12 July Friday	Evaluation Team Conference, Manuscript preparation
13 July Saturday	Presentation of Draft to BARC and Technical Assistance Team Members (Checchi ISNAR, ICLARM, IRRI, AVRDC).
14 July Sunday	Marlowe departs 1400 Hours.
15 July Sunday	Galt prepares for special conferences with Winrock International
16 July Monday	Dr. Galt departs 1400 Hours.