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INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER: AGRICULTURAL RESEARCH -- PHASE II

Volume II: Project Annexes

December 1980

USAID/Bangladesh

(Unclassified)

Agricultural Research Project Phase II

(Annexes)

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CABLE: APAC REVIEW OF AG RESEARCH PID (388-0051)

FROM : SECSTATE WASHDC Date: 27 Sep 1980

1. APAC reviewed and approved PID for subject project September 11. Following are issues discussed which need to be considered in the PP design stage.

2. APAC endorses Farm Systems Research (FSR) approach. Issue of research, small farmer linkage judged crucial to project and must be fully addressed in PP. Elements in linkage process needing detailed explanation include: How does training and visit (T and V) extension system fit with FSR particularly since T and V system utilizes crop by crop approach? ; what is the role of regional stations in small farming systems approach? ; What steps will be undertaken to insure research is relevant to small farmers? How do other donors and their project activities fit into this linkage? How are other components of input delivery system (e.g., seed, pesticides, credit, fertilizer, water) being handled to insure that farming systems research will operate on a continuum? Analysis of the input delivery system in this effort could also be basis for identifying complementary projects. For example, considerable discussion focused on constraints of existing seed multiplication capacity within Bangladesh. Functioning seed system that can provide quality seed on a timely basis was judged to be an essential ingredient for success in this proposed activity.

3. Careful and comprehensive analysis of budget, including BDG contributions, are required. Are all costs for field trials and technical support adequately covered? This project will necessitate considerable field work. APAC strongly recommends financing of pol, as a recurring cost, be transferred to BDG for financing. Full justification will be required if included as U.S. support line item in project. Are transportation capabilities to carry out this extensive effort sufficient?

4. Training requirements and related costs should be analyzed and justified in PP. While advanced degree programs are important, APAC concerned at assuring research relevance which requires a well trained cadre of research and extension personnel that knows how to deal with technical/economic problems within small farm environment. The feedback mechanism utilizing these trained personnel is to be explained in PP.

5. Mission requested AID/W comments regarding inclusion of support for rice research under project. Clearly, rice must be part of any small farming systems activity in Bangladesh and its support should be assessed with this in mind. Mission is in best position to assess needs for additional external assistance to the rice research/ production program in country over and above extensive support of other donors. In any case, APAC strongly recommended that any proposed aid interventions on rice within this project be conditioned on the premise that all funds go through BARC, not directly to BRRI. Further, it appears that this could be negotiating point with BDG to encourage BRRI to cooperate with and conduct field work through the BARI regional research centers as well as their own BRRI sub-stations. AID certainly does not advocate expansion and development of new BRRI sub-stations particularly in those locations where BARI is operating. Ishurdi is a case in point.

6. Comprehensive evaluation plan based on goals and purposes of proposed project and reflecting findings of evaluations on Ag Research I is to be include in PP design. Evaluation plan should also take into account the research small farmer relationships and cite the quantifiable indicators which will be used to measure project success.

7. As means of utilizing project to assist women, AA/ASIA requests Mission explore possibility of including home gardens component into project. Such activity has been successfully incorporated in AID projects elsewhere. Bureau prepared to provide supplementary technical and financial assistance in addressing home gardens activities. Request Mission advise on this point early in design phase.

8. Project definitely fits Title XII criteria. Mission must examine this matter closely in PP preparation. Services by present contractors under Ag Research I will not be automatically extended. expectation here is that the project must either be a Title XII undertaking or open to competitive selection of contractors.

9. IEE-APAC did not approve all of the Mission's IEE recommendations. It was recommended that all project activities except

use of pesticides be given a negative determination and that pesticides to be used in the project receive further environmental analysis. Need for further analysis is based on the fact that pesticides will be used in farmers' field trials and that information on pesticides used will be disseminated to local farmers. Services for the performance of such an analysis may be obtained at no cost to Mission through DS/AGR's centrally-funded project on pest management and related environmental concerns. Revised test of IEE will be pouched to Mission for concurrence.

10. The PP should contain a detailed procurement plan, indicating commodities to be purchased, procurement procedures and whether procurement agent will be used. Any waivers should be fully justified. If trail bikes waiver is needed, PP should address possibility of other donor financing as well as Handbook 1B.

Annex B: Agricultural Research Phase II -- Logical Framework Matrix

GOAL	INDICATORS	VERIFICATION	ASSUMPTIONS
Increase domestic food production, small farm income, and rural employment.	1. Decreased food imports along with increased availability of food supplies at stable prices; 2. Increased rural per capita incomes; 3. More employment at stable wages.	1. National agricultural production statistics; 2. National economic development reports.	1. Favorable weather conditions; 2. Stable domestic and international supplies of agricultural inputs; 3. BDG recurrent and capital budget allocations to research, extension, training and input supply will be available.
PURPOSE	**EOPS**	**VERIFICATION**	**ASSUMPTIONS**
Increase the effectiveness of agricultural research necessary for development and transfer of appropriate agricultural technologies to Bangladeshi farmers.	1. Multi-disciplinary farming systems research program effectively operating; 2. BARC providing effective coordination and direction in respect to implementation of national agricultural research efforts; 3. Core research program capacity effectively expanded in agriculture research institutes, especially BARI and BRRI.	1. Contractor records and reports; 2. BARC/BARI project reports records, and evaluations. 3. Scientific research publications.	1. Technologies and related systems socialy and economically acceptable to farmers; 2. BARC mandate and authority maintained; 3. Sufficient agricultural research institute personnel provided to project;

OUTPUTS	INDICATORS	VERIRICATION	ASSUMPTIONS
1. Approved national agricultural research plan for the 1980's. 2. New farming systems interventions available to small farmers. 3. Core component research staff trained and on the job.	1. Added BARC staff in research and financial management. 2. Farming systems research findings published and available in crops livestock, economics, soils, water and pests areas. 3. 82 Research staff members have received training.	1. Project reports evaluation and publications; 2. Contractors reports; 3. On-site visits with farmer participants.	1. Contractor inputs provided in timely manner. 2. Project Plan implemented as scheduled. 3. USG and BDG funds disbursed as planned.

INPUTS	INDICATORS	VERIFICATION	ASSUMPTION
(USG) 1. Technical Assistance 2. Training 3. Commodities/vehicles and construction	1. Advisors (72 years) 2. Participants LT/US 384 months LT/3rd C. 372 months ST/3rd C. 279 months 3. For equipment, supplies, etc. see activity budgets.[1]	1. Project disbursement records 2. Audit Reports 3. Project evaluation reports.	1. Project Plan implemented as scheduled. 2. AID and BDG funds disbursed as planned. 3. Project procurement and services delivered in planned time frame.
(BDG) 1. Staff 2. Equipment 3. Facilities	1. New/old staff position created/filled 2. Equipment in use 3. Facilities in use.		
(IBRD) 1. Vehicles	1. 40 4-WD vehicles 250 motor scooters and 300 motor cycles in use.		

The Status of Agricultural Research Programs[1/]

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Introduction

The value of investments in agricultural research has been recognized for some time. The need for a strong national agricultural research program has also been established given that the uniqueness of local cultivation conditions requires the development of special agricultural technologies on the testing and validation of agricultural technologies (e.g. seed varieties) imported from abroad.

In Bangladesh, while there has been a long history of research dating back to Colonial time, during the last quarter century political discord, war and flood have impeded progress. During the last decade, in an effort to stimulate agricultural research there has been a steady fragmentation of effort into mono-crop institutes. This has resulted in an unfortunate proliferation of institutions under 8 different ministries with various ordinances and mandates. These various ministries, semi-autonomous institutes, and educational facilites undertaking agricultural research have generally tended to plan and operate individually. Scarce physical resources and human manpower capability have often not been wisely utilized.

1/ This annex draws principally from three publications: Moseman Review Team Report, Bangladesh Agricultural Research System, July 1980; World Bank Report, Bangladesh: Appraisal of an Extension and Research Project, 1977; BARC National Agricultural Research Plan, 1979.

Duplication of effort and redundancy of field installations further debilitate their collective contribution to national development objectives.

The dismantling of any of these agencies into one multicrop institute seems unlikely. An alternative which Bangladesh has elected to pursue is to coordinate agricultural research based on the models of India, Philippines and Indonesia where planning, coordinating, monitoring and funding research are under one agency. Consolidating all research activities under one agency has been viewed with some scepticism given the mixed performance achieved in the 1970s when all agricultural input delivery activities for seed, fertilizer, water and pesticide were consolidated under the Bangladesh Agriculture Development Corporation (BADC). See Annex F.

Rather, the course of action to date has been to allow a more loosely structured agricultural research "program" to operate in Bangladesh within which each institution conducts its own activities but in consultation with other research agencies and in accordance with general guidelines laid down by a coordinating council on which each agency has a representative. While still in its infancy, this coordinated research approach has shown enough positive performance and future promise to have earned the growing support of its member research agencies and foreign donors alike.

The Bangladesh Agriculture Research Council (BARC)

In an effort to coordinate agricultural research activities emulating from more than the 20 institutes under 8 ministries, the Bangladesh Agricultural Research Council (BARC) was established in 1973, as an autonomous body. While BARC is technically under the Ministry of Agriculture its governing council and program review committee consist of representatives of all agricultural research institutes. BARC is charged with the responsibility of coordinating research based on criteria and goals established by Government. Its Program Planning and Review Board periodically brings together leaders of the eight ministries and participating institutions which conduct agricultural research, in an effort to plan, fund, implement, monitor and achieve greater coordination of their activities.

Recently BARC initiated three programs to bring together research institutes in a collective effort to focus their resources on specific crop production problems:

- National Coordinated Farming Systems Working Group
- National Coordinated Pulse Research Program
- National Coordinated Soya Program
- National Soil and Water Management
- National Socio-Economic Research

The Farming Systems Working Group is the first attempt at undertaking comprehensive research at the farm level. Further, it is a means whereby scarce research personnel and skills can be utilized through sharing among institutions. BARC's Farming Systems approach acknowledges the validity and importance of strengthening core research programs within the participating agencies, but doing so in a fashion that will generate technological interventions that are compatible with farmers' existing systems and capabilities.

The main limitation of BARC in the past has been the lack of clarity in the level of authority of the Vice-Chairman of the BARC. This was reflected in the poor attendance of government officials at important BARC meetings. Despite its statutory powers, historically BARC had little more than advisory influence over how the main research institutes allocate their budgets. Under such circumstances BARC's effectiveness is impaired in directing agricultural research activities towards national development goals. Time will effect the cure. Very recently the Ministry has advised Directors of BRRI and BARI that their research programs must now be scrutinized and approved by BARC.

Bangladesh Agriculture Research Institute (BARI)

The organization, physical layout of facilities and staffing of BARI has been extensively covered in other reports. (See References). Attention here is focused on BARI farming systems activities.

Headed by the Minister of Agriculture, BARI became a multi-crop semi-autonomous research institution in 1976, responsible for research on those crops which are not mandated to the other specialized institutes. BARI contains nine research divisions which are

represented throughout 19 research stations: Joydebpur Central Station, 4 regional stations, 9 sub-stations, and 5 specialized crop research stations. This past year BARI published a 5-year Research Plan including prioritized research programs, projects, manpower and other resource needs.

Of particular interest is the Farm Trials Division (FTD) which has emerged from the incorporation and subsequent functional expansion of the Soils Fertility and Testing Institute and its 200 field units (10 per district). Under the new organization the FTD will field test possible improvements of one or more aspects of farming systems. This feedback mechanism will allow farmers' experiences to reach the scientist so that he can re-direct research towards more appropriate, farm-oriented systems based on farmers' real resource operating base.

At present the Farm Trials Division has been conducting research on rice, wheat, corn, mustard, lentil and gram. Although many thousands of trials have been conducted, much of the experimentation has been poorly implemented for a variety of reasons including poor supervision, lack of trained manpower, inadequate supplies and services. Moreover, lack of transport and lack of facilities such as simple field scales or drying ovens have also contributed to inferior on-farm testing. It is important to provide field equipment, transport, and staff training that combine to provide effective on-farm trials. This is especially true if the future thrust towards on-farm testing is to be realized with quality performance.

The Farm Division has been broadened from its original focus on soil fertility trials and varietal trials to include all types of farm research. This was prompted by the recognition that research conducted in the farmer's field has a greater chance of relevance and adaptability.

BARI has Technical Advisory Committees (TAC) at the central and regional levels where there are task forces including scientists, extension personnel and local government officials to exchange findings of the 200 FTD centers. Problems and innovations derived from trials conducted in farmers' fields are fed back to multidisciplinary Experiment Station Scientists.

BARI has also set up four multi-disciplinary Technical Committees in the following areas:

1. Seed varieties, pests and diseases

2. Cultural practices, tools and machines, and fertilizer

3. Cropping systems, agricultural economics, and farm management

4. Training and communication systems.

The BARI Core Disciplines which feed into these 4 integrated programs include: cereals, pulses, oil seeds, fiber/tobacco, fruits and palm vegetables, spices, roots and tubers, soils and water management program, and post-harvest technology.

Bangladesh Rice Research Institute (BRRI)

The BRRI is a mono-crop research institute with most of its resources devoted to rice,

Like BARI, BRRI was established as an autonomous institute in 1973 at Joydebpur. BRRI has 15 research divisions, one of which is the Rice Cropping Systems Division, that manages a collaborative research program with seven other government and private agencies. The BRRI Cropping Systems Program currently has 28 field research sites centered around the 5 BRRI regional stations.

More than 500 extension agents from various institutes have received training at BRRI, 150 of whom have graduated from the 4-month Rice Production Training Program. Cropping Systems methodologies are an integral part of the training. Special emphasis on multi-disciplinary and multi-management practices are included in the program. BRRI's "Training of trainers" role conducts research horizontally across the vertical boundaries established by the national research pattern.

Most BRRI rice trials are conducted in areas where water control is not a serious problem. Recently BRRI began to focus research on sub-optimal rice-growing areas in terms of water management; most notable among these is its deepwater rice research. BRRI has also concentrated on producing rice seed. Research has included varietal response to different fertilizer treatments and improved agronomic practices.

Bangladesh Agriculture University (BAU)

The BAU was established in 1962 at Mymensingh to educate most of the research scientists for the various institutes as well as specialists for other agencies of the agriculture sector. (See Annex E.). It has more than 100 Ph.D's on its present staff, of which more than 90% have received their training overseas.

BAU also has a research program conducted by both teachers and M.Sc. students. Current research activities include rice varietal testing, tobacco management, vegetable cropping, irrigation and water management, fertilizer studies (including zinc and sulfur deficiencies) and cropping systems. Research proposals and results are reviewed by a Faculty Advisory Committee composed of the six faculty deans: Agricultural Engineering, Crop Sciences, Aquaculture, Animal Science, Veterinary Science, and Agricultural Economics.

BAU is often criticized for its somewhat detached approach to research, which has left the university behind in generating research relevant to the needs and resources of Bangladesh farmers. Current efforts underway to restructure BAU's research program should permit its resources to contribute to national development goals. BAU graduate studies policies also need reform; only a limited time is allowed for off-campus research under current residency requirements for M.Sc. degrees. As a result, students base their research on secondary data sources and graduate with no practical field experience in farm trials, statistical sampling, survey procedures, etc.

Other Semi-autonomous Agricultural Research Institutes

The Jute Research Institute (JRI) established in 1973 under the Ministry of Jute, is headquartered at Dacca. Its sub-stations test jute varieties for high fibre yield potential and increased fibre quality as well as tolerance to drought, water-logging, salinity and other conditions in jute growing areas. A strong need is recognized for research on the physiology of flowering, pest and disease control, seed production, technology for improvement of fibre color and development of bacterial innoculum for quick setting. Because jute generates more than 70% of the country's total foreign exchange earnings, it will continue to receive special research attention. The JRI has recently initiated a cropping systems research project under the national coordination of BARC.

The Sugar Research Institute (SRI) was established in 1951 under the Ministry of Industries. Despite the fact that a significant proportion of the 360,000 acres of sugarcane land is inter-planted with other crops, particularly pulses, limited research has been done on its role in farming systems. To date sugarcane research activities have been concentrated in the following areas:

1. Collection and conservation of genetic resources;

2. Development of pest-resistant, high-yielding and high-sugar-content varieties;

3. Soil and fertilizer management;

4. Improvement of agronomic practices.

The SRI also has recently implemented under BARC a Cropping System Research Project.

The Tea Research Institute (TRI), under the Ministry of Commerce addresses an important industrial crop which contributes about 10% to the country's total export earnings. Tea research focuses on the roughly 100,000 acres divided among approximately 150 tea estates. Priority research activities include the introduction of high yielding clones and seed lots, rehabilitation of old tea soils, evaluation of fertilizer response, physiology of vegetative propagation, and improved crop management.

The Fisheries Research Institute (FRI) at Chandpur is contained with the Directorate of Fisheries under the Ministry of Livestock and Fisheries. This Institute and the College of Fisheries at BAU are judged as the principal institutions within Bangladesh that have research competency of any breadth, although Dacca and Chittagong universities are also involved to a lesser degree. The major donor input to this sector is the $ 5.5 million World Bank Irrigation and Fisheries Development project in Chandpur area which covers 215 square miles and contains some 28,000 ponds. Although some research is involved in the project, the major thrust is in the development of a fresh water fisheries hatchery complex with related open water management programs and fisheries extension.

Fisheries research has taken on new importance due to its potential economic and social impact on the lives of millions of people that inhabit the lands bordering the Bay of Bengal, estuaries and mangroves, rivers, lakes and ponds. This research priority activity has been accelerated by the fact that fish is a valued food product in the country and that environmental damage to spawning areas has been caused by roads, irrigation canals and other infrastructure. Much has been done in the aquaculture area on production and cultural systems, crustacean and mollusc culture, species improvement; the recycling of crops residue and animal wastes and other cheap fuel materials is also being tested. However the overall research effort has been extremely fragmented, highly academic,and uncoordinated.

The SFYP advocates significant new investments in fisheries and it implies that fisheries research should move from the traditional academic approach to addressing the practical problems of utilizing the four million acres of perennial inland waters and the seven million acres of water surface estimated to be available

seasonably in lowlying areas. This includes research programs that address fish and technology, aquaculture systems, pond engineering, fish nutrition, processing and marketing, fish-crops-small animal farming systems, breeding pathology and parasitology, and fisheries feeding.

The Livestock Research Institute of the Ministry of Livestock and Fisheries addresses issues related to the 100 million livestock and poultry animals in Bangladesh and their use as food products (meat, milk, eggs) and by-products (hides, skin, bone). Improved utilization of crop residue and agro-industrial wastes is a special component of livestock research.

Priority research in livestock includes:

1) Optimum schemes related to integrating fodder crops production into village level farming systems to improve draft animal nutrition and to increase milk productivity;

2) Improve feed value of farm wastes and by-products;

3) Improvements in animal draft power;

4) Improvements in husbandry practices and animal health.

Livestock research has had little evident impact on livestock production, largely because of meager budgetary support and lack of a coordinated livestock research and development plan. The opportunity to strengthen the livestock sector so it can contribute to the draft animal, poultry raising, and cattle fattening activities of small farming systems needs to be exploited.

The Forestry Research Institute is located at Chittagong under the Ministry of Agriculture and Forestry. Its research program is broadly divided into 2 categories:

1) Forest Management Research dealing with all aspects of growing forests and production of primary products (timber, fuel-wood, bamboo, etc.)

2) Forest Products Research dealing with technological aspects of all processed products such as sawn wood, panel products (plywodd, particle board,) and hardboard pulp and paper (newsprint, writing, printing paper,etc.)

Recommended forestry research topics include the following:

1) Pilot plantation testing of fast growing and high yielding tree and bamboo species;

2) development of manufacturing products and processing;

3) economic studies in logging, transportation systems and forest based industries;

4) ecological changes in man-made forests.

Despite national dependence on wood for fuel, for house construction and for fabrication of small farm implements, no forest or wood production research has yet been undertaken. As in other countries, forest depletion outstrips forest production in Bangladesh.

Agricultural Research Budget Allocations

A breakdown of agricultural research budget allocations by research institute is contained in Table C-1. Notable are the major allocations to BARI and BRRI the two research institutes involved in the most important food crops. The annual increments in allocations from the revenue budget, which covers salaries, operating overhead, maintenance, have increased at a rate higher than overall research allocations as well which reflects the expanded programs of these institutes given their new facilities and larger staffs.

The overall agricultural research budget has grown along with that of the entire agriculture as seen in Table C-2. Still it is evident that as a share of the total agriculture budget, research allocations have not always kept pace. This reflects, of course, the fact that fertilizer subsidies loom very large in the overall agriculture budget. Still over the last 5 years, research expenditures alone have accounted for over to 10 percent of the development budget and 12 percent of the revenue budget in some years.

The pace at which allocations for agricultural research will grow in the future is uncertain . A low 10 percent and a high 20 percent annual increment in allocations are projected in Table 3. Given inflationary pressures combined with the need to further consolidate research programs with added trained staff and more equipment to take research to the field suggests the higher 20 percent growth rate to be the bottom line to be expected over the SFYP period.

Table C-1: BDG Agricultural Research Institution Allocations (In Lakh Taka)

Name of Institutes	Year 77-78			Year 78-79			Year 79-80		
	Total	Capital	Revenue	Total	Capital	Revenue	Total	Capital	Revenue
1. BARI	678.50	556.50	122.00	669.96	535.25	134.71	1,092.18	734.36	357.82
2. BRRI	350.00	281.45	68.55	266.00	203.00	63.00	274.57	182.00	92.57
3. JRI	441.50	325.00	116.50	520.00	378.50	141.50	432.00	171.00	261.00
4. Tea Board	40.00	36.00	4.00	50.00	42.00	8.00	204.00	196.00	8.00
5. SRI	25.00	25.00	-	35.00	35.00	-	20.00	20.00	-
6. BAU	610.00	7.50	602.50	15.00	12.00	3.00	72.83	14.00	58.43
7. INA	40.00	35.00	5.00	25.00	15.00	10.00	60.00	35.00	25.00
8. Fisheries	637.99	474.40	163.59	1,099.71	991.55	108.16	1,176.80	1,019.	157.80
9. Forests	894.00	699.95	194.05	1,028.00	714.40	313.60	1,332.00	906.85	425.15
10. Livestock	600.00	529.37	70.63	1,155.00	923.11	231.89	1,300.00	986.64	313.36
11. BARC	36.00	-	36.00	40.00	-	40.00	65.00	-	65.00
Total	4,352.99	2,970.17	1,382.82	4,903.67	3,849.81	1,053.86	6,029.30	4,264.85	1,764.53

Source: Annual Development Plan of the Ministry of Planning.

Table C-2: Development and Revenue Budgets For Agriculture and Agricultural Research
(In Million Taka)

Years	Development Budget* b/			Revenue Budget** c/		
	All Agriculture	Ag. Research	Research as %	All Agriculture	Ag. Research	Research as %
1975-76	1033.60	84.61	8.19	56.80	7.24	12.75
	(+23%) a/	(+12%)		(-15%)	(-46%) e/	
1976-77	1266.20	94.99	7.49	48.13	3.89	8.08
	(+2%)	(+46%)		(+.2%)	(-10%)	
1977-78	1286.42	138.48	10.76	84.24	3.48	7.21
	(+51%)	(+33%)		(+41%)	(+45%)	
1978-79	1945.31	184.20	9.47	68.05	5.05	7.45
	(+4%)	(+12%)		(+11%)	(+12%)	
1979-80	2025.68	206.10	10.17	75.52	5.66	7.49
	(+32%)	(-11%) b/		(+98%)	(+10%)	
1980-81	2664.30	183.80	6.90	149.48	6.25	4.18

* Source: Ministry of Planning
** Source: Ministry of Finance

a) Figures within parenthesis represent annual increase (+) or decrease (-)

b) Development budget covers both capital and operational expenditure on temporary basis. The figures under development budget from 1975-1980 were taken from Revised Annual Development Plans and for 1980-81 from Annual Development Plan made by Ministry of Planning. The Development budget for Agricultural Research declined in 1980-81 compared to 1979-80, because major construction work completed in 1979-80.

c) Revenue budget covers permanent operational expenditures; this budget for Agricultural Research for 1976-77 was lower than 1975-76, because BARI allocations were transferred to the development budget when BARI became an autonomous organization.

d) All Agriculture Sector budget includes all schemes relating to crops except fisheries, forests and livestock.

e) Agricultural Research budget includes all the schemes of BARI, BRRI, SRI, JRI, BARC, Soil Survey Institutes and Nuclear Agriculture.

Table C-3: Project Development and Revenue Budget For Agriculture and Agricultural Research

(In Million Taka)

Years	Development Budget		Revenue Budget		Total Budget	
	Agriculture	Research	Agriculture	Research	Agriculture	Research
			(Projection at 10 percent)			
1981-82	2930	202	164	6.9	3094	208.9
1982-83	3223	222	180	7.6	3403	229.6
1983-84	3545	244	198	8.3	3742	252.3
1984-85	3899	268	218	9.1	4117	277.1
1985-86	4288	294	240	10.0	4525	304.0
			(Projection at 20 percent)			
1981-82	3223	222	180	7.6	3403	229.6
1982-83	3545	244	198	8.3	3742	252.3
1983-84	3889	268	218	9.1	4117	277.1
1984-85	4288	294	240	10.0	4525	304.0
1985-86	4716	323	264	11.0	4977	334.0

Source: See Table C-2 for earlier years on which these projections are based.

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Introduction

Though successful adoption by farmers of improved technology depends upon such factors as its potential profitability, risk transport and availability of supplies, the technology itself is very important. The suitability of improved technology is a major influence on farmers' willingness to adopt it.

Bridging the gap between research results and farmer practices lies primarily with the extension service and the extension agent. This continues to be so, despite the very mixed performance of extension in general. Other schemes using cooperatives, input suppliers and radio schools have been tried, also with mixed success. Because of farmers' limited literacy and lack of capital (to purchase radios) in rural areas of developing countries, the extension agent approach has appeared to "fit" well as a linkage between the research station and the farmer's field.

However, the concentration of hundreds of thousands of small cultivators in rural areas has required the employment of thousands of extension agents to be effective. This in turn has placed heavy burdens on teaching institutions to train these agents (see Annex E), on administrative structures to support and coordinate their activities, and on government budgets to provide their salaries, logistical support and equipment needs.

1/ This Annex is an updated excerpt from the World Bank Report "An Appraisal of Agricultural Extension and Training Programs in Bangladesh, 1976" and commentaries derived from the July 1980 Team Review report on "Bangladesh Agricultural Research System".

At present, over 20 institutions have mandates to provide agricultural extension services to Bangladeshi farmers. However, most of their programs are functioning at less than optimal level. At the thana level, between 12 and 20 officers, most with subordinate staff, represent these agencies. Farmers complain that they must see a different official for every problem, and that they cannot get needed advice on a timely continuing basis. There is a need for a clearer definition of responsibilities and for integration of services which are now fragmented, overlapping and sometimes competitive. Recent expansion of rural programs has stretched thinly available staff capabilities making efficient use of available manpower even more mandatory. The following is a brief summary of the current organization and operation of extension service programs within Bangladesh.

The Directorate of Extension and Management (DEM)

The DEM of the Ministry of Agriculture has a 6-level extension network:

	Extension Level	Number*	Training Level**
1.	National Directors	12	Agriculture Graduate
2.	Regional Directors	8	" "
3.	District Agriculture Officer(DAO)/ District Extension Officers (DEO)	21	" "
4.	Sub-Divisional Agriculture Officers (SDAO)	87	" "
5.	Thana Agricultural Officers (TAO)/	455	Agriculture Diploma
	Thana Extension Officers (TEO)	413 (332)	" "
6.	Union Agricultural Assistants (UAA)/ Village Extension Officers (VEO)	7,800 (4700)	" "

* Numbers of positions and (in parenthesis) numbers of positions filled in June 1980.

** Agriculture graduates have B.S or M.S. degrees after 12 years of primary and secondary school; agriculture diplomas have two years of special training after ten years of primary and secondary school.

Most DAOs hold B.Sc. or M.Sc. degrees. Their contact with farmers is usually limited to occasional lectures at Thana Training and Development Centers (TTDCs). The DAO is provided with a four-wheel drive vehicle and housing accomodation. The SDAO is generally also a university graduate and some function as assistant DAOs. The SDAO supervises the work of TAOs.

Agricultural expertise in the thanas is represented by a TAO who has usually been recruited from among the UAA cadre and whose diploma-level educational background and experience is insufficient for this key extension position. The average TAO is in charge of 10 UAA's, in an area of 342 square kilometers with a population of up to 180,000 in 200 villages. Occassionally he is provided accomodation at the TTDC but not with a means of transport or sufficient travel allocations to move about. For example, the TAO in the Mymensingh Kotwali Thana can spend only Tk.250 annually on travel. Guidance and supervision are therefore difficult and TAO's usually spend most of their time in the office. An important part of the TAO's duties is participation in TTDC instruction but his influence over the curriculum, developed by the Project Officer of the Integrated Rural Development Program (IRDP), is generally minimal.

The UAA or VEO is expected to be the jack-of-all-trades at the sub-thana level. Formally he reports to the TAO, although he is frequently requested by other thana level officers to assist them with various time-consuming tasks. On paper his job description is vague: he "motivates" the farmers and "assists" them; in practice his job is reduced to talking, except for the UAA's who live with influential farmers. The latter group tends to be more involved in practical farming.. Most of the UAA's time in the field is spent on assistance to block farmers, and to IRDP cooperative societies' model farmers. Activities outside these groups are apparently very limited.

Terms of service for extension workers are poor, including low salaries and lack of opportunities for advancement. There are, at present, 4,153 UAA's. This means a ratio of 1 UEA/5,000 acres or 1 UA/2,000 farm families. The UAA has no means of transport and no travel allowance for travel within five miles of his area of posting. He must find his own housing, frequently difficult in rural Bangladesh, and many UAAs have unsatisfactory housing arrangements. In addition, field staff have been burdened with extraneous responsibilities, such as collection of census data.

In a sample survey of UAA's (Rasul, 1974) the majority (58%) were matriculates with some in-service training, 30% were of lower educational standard and 12% were above matriculate standard. The survey also found that 51% of the UAA's were married but living alone, their families being left behind in their home areas for lack of accomodation. About 7% were bachelors, 20% lived with their families in the union but away from their home areas, and 22% attended office from their home farms. A considerable number (33%) had to find their lodging with farmers. Few UAA's have an office of their own, or facilities for entertaining visiting farmers.

An approach to remedying the plight of the extension service and its staff was undertaken with World Bank sponsorship in 1978. This Training and Visitation (T&V) program began operation in the Northwestern (Rajshahi) Division as a pilot project to up-grade the quality of the DEM staff and to increase its effectiveness at the farm level. Within the T&V framework DEM staff is strengthened by the addition of four senior Crop Production Specialists assigned at regional level. These specialists coordinate the work of crop production specialists in training units at the Sub-divisional level. A District Training Officer assists in designing by-weekly training sessions of TEO's/TAO's, S.D.A.O.'s UAA/VEO's, conducted by the crop specialists. Thus the T&V system strengthens the DEM extension network by "training the trainers" (Senior Crop Production Specialists train the Sub-divisional level crop production specialists), who in turn train the extension workers (UAA/VEO's).

The visitation part of "training and visitation" is a highly organized scheme in which one UAA or VEO visits 160 specific farmers every two weeks. He is assigned a block which is divided into 8 sub-blocks, each with 20 "contact farmers". Each UAA visits one sub-block daily for 8 days per fortnight. Two days per fortnight are devoted to training: one day at the Sub-divisional level Training Unit; one day with the Thana Extension Officer. The remaining two days per fortnight are spent on administrative and "make-up" visits.

The Plant Protection Service is a separate Directorate under the Ministry of Agriculture, though at the field level its staff shares office with that of DEM. Plant Protection Inspectors operate at the District level. Four personnel function at each Thana: one Plant Protection Assistant (PPA), one Assistant Plant Protection Inspector (APPI) and two mukaddams (PP workers). 1,400 mukaddams are in the field. Thana plant protection officers advise the general extension staff on pest control measures and particularly in the use of pesticides and sprayers which are distributed by private dealers. (See Annex F).

Jute Extension Service

In 1971, a parallel set of specialized extension workers was developed for jute production. Many of these jute extension workers were farmers trained under the Intensive Jute Production Scheme at TTDCs who were hired as full-time government extension workers.

Jute Extension Officers (JEOs) rank as SDAOs although they are only diploma holders. One subdivision may have several SDAOs Jute Production, each in charge of only 10 blocks. There are a total of 132 SDAOs as compared to 84 SDAO's for general extension in the whole country.

At the field level there are 1,428 Jute Extension Assistants (JEAs), each in charge of one jute block of farmers who cultivate a total of about 200 acres of jute. The blocks receive intensive extension services and input supply. In theory, the educational status of the JEA is Intermediate of Science (matriculation and two years of science) but many are matriculates with only some experience from the Intensive Jute Production Scheme. JEO and JEA salaries are equivalent to those of their counterparts in the general extension service. The provision of jute seed is currently the responsibility of the jute extension service. This is part of its justification as a separate service.

Integrated Rural Development Program (IRDP)

The Ministry of Local Government, Rural Development and Cooperatives under the IRDP has set up Thana Central Cooperative Associations (TCCA's). The TCCA's are involved in extension to farmers through Thana Training and Development Centers (TTDC) where offices of different line agencies conduct training in cooperatives and credit management, operation and maintenance of irrigation equipment and sources of supply and services. Approximately 38,000 model farmers have been trained at TTDC's. Model farmers in turn act as extension agents in disseminating the knowledge and skills to other farmers. A Thana Irrigation Program (TIP) also functions as an extension medium in transferring information to water users' cooperatives on the use of inputs and credit.

The extension system under Local Government, Rural Development, and Cooperatives, based on the Comilla program, has expanded to 300 thanas (64% of all thanas). It is based on the strong belief that the most cost-effective method of extension in Bangladesh (a nation of small, fragmented farm holdings) is that which uses trained farmers as extension agents to reach the remaining 8 million small farmers.

IRDP has maintained that the ultimate link for conveyance of information on innovations to farmers should be a village extension worker. He is selected by, responsible to, and paid by the village cooperative, and trained continuously at the TTDC. This idea seems to make sense when planned innovations are uncomplicated and within easy reach of all farmers. But, at a later stage, TTDC training will be insufficient to keep the village level worker ahead of his fellow-farmers. He will then require substantial formal re-training which the cooperatives may not be willing to finance.

In addition to the staff mentioned above, the following specialists at thana level have some extension duties among their responsibilities:

- The Registrar of Cooperatives (Ministry of Local Government, Rural Development and Cooperatives) who supervises the management and auditing of cooperatives,

- The Fertilizer Inspector (BADC) who supervises the procurement, distribution, storage, and sale of fertilizers,

- The Seed Development Inspector (BADC) who supervises the procurement, distribution, storage, and sale of seeds,

- The Irrigation Officer (BADC) who organizes pump groups, distribution, operation, and collection of pump rents,

- The Sectional Officer Tubewells (BADC), who plans and organizes cooperative tubewell schemes (the physical execution is made by contractors) and collects rents,

- The Livestock Officer (Ministry of Livestock and Fisheries) who is in charge of veterinary services and supervises the Livestock Assistants. He does some extension work on feed production, feeding and management, and

- The Fisheries Officer (Ministry of Livestock and Fisheries) who instructs farmers on technical aspects of fisheries.

Other Extension Activities

Water Development Board's (WDB) extension service is staffed by 200 field agents and one Chief Extension Officer for each of the 5 project areas where it manages irrigation schemes.

BARI's own outreach activities center around its 19 research stations. Field days are conducted which bring scientists, trainers, extension agents and farmers together for exchange of technologies and farm problems. BARI's 200 Farm Trials Division Centers are another point at which research and farmers interface.

BRRI's 28 rice-based cropping system sites also act as extension vehicles for transmitting improved packages of rice technology and management practices. In addition, BRRI's 5 Sub-stations act as extension mediums through their field days and workshops. Annual meetings of the 35 participants in IRRI's six month training program in Cropping Systems are sponsored by BRRI. These 35 individuals represent an excellent core of personnel trained in the same philosophy and methodology of the cropping systems approach.

Finally, in addition to government agencies there are over 30 voluntary organizations working directly or indirectly in extension activities, in some cases in support of the regular extension service. Most notable among the private voluntary agencies is the Mennonite Central Committee (MCC) which has agricultural extension offices in 2 districts: Comilla and Noakhali. MCC extension offices work through schools, IRDP cooperatives, model farmers, and boys' clubs. The 20 MCC staff have recently reduced their extension efforts and are now concentrating on expanding a cropping systems research program.

Problems and Prospects for Extension Programs

Government programs in agricultural extension stress the need to increase manpower levels if food production goals are to be met. The SFYP envisages 6,000 VEA's to be deployed by 1984/85 (in addition to the existing UAA's). The number that could be graduated from the AETI's during the period can hardly exceed 1,000. Consequently, there is the possibility that the formal requirement of completed AETI training will be waived and progressive jute farmers and UAA's will be retrained as VEAs. The Jute Extension Service itself could be phased out and jute extension assistants absorbed into DEM.

UAA's will probably have to cover a wider area. The Government suggests a ratio of one VEA per 1,000 cropped acres in areas of concentration and one per 2,000 cropped acres outside these areas. The latter figure, recalculated in terms of farm families per VEA means approximately one VEA per 730 families. Even this ratio may be too ambitious. In view of available resources, one VEA per 1,000 farm families would seem a more realistic long-term target.

Of more concern than the quantity of extension agents is the quality of their performance. Recent evaluations of the existing extension services have not had to probe deeply to find evidence of duplication of effort, under-utilization of manpower, disincentives for efficient work performance and poorly trained "specialists".

The list of problems could go on, but essentially the constraints within the agricultural extension service in Bangladesh evolve around these central points:

1. Lack of "extendable" technology;

2. Little coordination in establishing goals to measure progress among national, regional and local extension units;

3. Non-agricultural duties limiting extension effectiveness;

4. Limited mobility and too many farm family contacts;

5. Insufficient understanding of "whole farm" environment;

6. Inadequate practice or training in the skills required for the new technologies;

7. Inadequate incentive programs.

The World Bank has been the most active in suggesting measures to overhaul the extension service through its T&V program which in its next phase will be expanded nationwide. It is noteworthy to summarize the recommendations made by one World Bank team (IBRD, 1975) evaluating the problems related to improvement in extension service at the field level. Specifically, the team noted that to work effectively, every extension agent should have access to:

1) An innovation package, i.e. recommendations, including booklets, pamphlets, and posters, on a combination of improved husbandry and inputs, adapted to various zones of the country. The package should be supplied by the concerned research institute.

2) Tools and implements for demonstrations and maintenance of demonstration fields.

3) Seeds, fertilizers, pesticides (alternatively a package of inputs for a standard size demonstration field to be supplied by the concerned research institute), and plant protection equipment.

4) Training-aids and necessary office equipment.

5) Incentive pay. As has been indicated earlier, no simple objective evaluation system for extension work is available. The evaluation needed to establish a basis for an incentive pay system would have to be based largely on objective criteria. The matter is important and merits further consideration.

6) Status. A complex concept with many elements; salary is one, and acceptance as a skilled farmer (training) is another important one. Provision of a bicycle as well as an office and an improved housing situation, permitting the UAA/VEA to live with his family, would all contribute.

7) In-service training, given the numerous deficiencies of the current pre-service AETI training programs. Intensive recurrent in-service training programs conducted by research institutes and in-service training institutes should be sequential and aim at a gradual transformation of the extension service.

8) Well-defined scopes of work. Tasks irrelevant to agricultural extension such as crop forecasting should be discontinued. Detailed job descriptions and supervision and evaluation based on the job description would be useful tools.

9) Teamwork opportunities. Facilities should be created for staff dealing with extension, credit and input supply and related services to work as a team, each with well defined tasks, at the village level as well as on higher levels.

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Introduction

The effectiveness of agricultural training programs will probably do more to determine the pace, quality and durability of agricultural research in Bangladesh than all donor-funded assistance for equipment and facilities combined. A strong agricultural training program is a requisite in Bangladesh to produce both skilled scientists to generate research findings and competent extension agents to get these findings out to farmers.

Many of the problems faced by the nation's agricultural research and extension programs today can be traced to shortcomings in the university and vocational level agricultural training programs. Existing agricultural training institutions simply are not operating at acceptable levels for meeting the country's demand for trained manpower. The facilities are generally inadequate or underutilized, and their curricula are heavily theoretical and too static to absorb the new technologies. Some of the rural training institutions have grown haphazardly and without firm and/or timely budgetary support. While they may profess a degree of multidisciplinary endeavor, many still operate as highly structured entities with little contact or linkage among the disciplines. In the last several years, there have been indications some of these academic barriers may be "loosening up", but it will take strong leadership from the top to correct many of the chronic problems within the system.

Clearly, Bangladesh could benefit from outside resources and educational opportunities in the near future in order to improve upon its national agricultural education system.

Bangladesh Agricultural University (BAU)

In 1961 an important landmark for the development of the country's agricultural sciences was made with the establishment of the Bangladesh Agricultural University (BAU) at Mymensingh. Many believed this could become the central meeting ground in the then East Pakistan where the nation's agriculturalists would be provided the latest scientific concepts and information basic to improved agricultural technologies. BAU in its early years showed the promise of being a leader in scientific agricultural endeavours as well as a principal trainer of scientists and technologies to serve research and enhance agro-industry.

BAU has received considerable external assistance from USAID and IDA over the past 20 years, particularly in the 1960's. Under an AID contract during the 1960's, Texas A & M provided over 70 person years of professionals predominanting in 6 major technical fields. Texas A&M was also instrumental under the AID contract in developing educational opportunities at the M.Sc. and Ph.D. level in the United States for over 40 professionals. The USAID and IDA assistance developed modern physical facilities (classrooms, laboratories, library, hostels, and staff quarters) and an instructional farm of 1000 acres.

After a decade of rapid growth, BAU was maintaining a B.S., M.Sc. and Ph.D. program which contained almost 25 disciplines. During this era, significant progress was made in improving their instructional programs. However, the quality of research undertakings improved at a much slower rate. With an impressive physical plant essentially in place and the return of many of its professional staff back on campus from post graduate study programs abroad, the university appeared well on its way to fulfilling its mandate.

Unfortunately, in the early seventies national liberation and its immediate reconstruction period created severe upheavals in the University program which is still regrouping to regain some measure of the earlier performance.

While BAU was developed as an autonomous institution, it is now affiliated with the Ministry of Education. The University employs about 270 professionals on its teaching staff. The majority are foreign trained and about one fourth have Ph.D. degrees. BAU concentrates its offerings in bachelor and masters' degree programs and currently enrolls about 2,800 students. From 1972 to 1980, only 3 students earned the Ph.D. degree, and at present only 5 students are enrolled in Ph.D. programs in 4 disciplines. Students enroll in one of six faculties: agriculture, veterinary science; animal husbandry; agricultural economics and rural sociology; agricultural engineering and technology; and fisheries. Total admissions since 1974-75 were 3335, but it is difficult to establish a norm in annual enrollment and graduates, since a combination of strikes and student unrest caused periods of university closure and backlogs of examination. Some stabilization now exists on the campus and the 1979-80 admission again climbed to 739 from a low of no admissions in 1976-77.

Due primarily to these campus upheavals and the inadequacy of financial resources from Government, BAU has tended to drift into semi-isolation. The effects are noted in the reduced staff and student involvement in national research and extension programs. The fact that it is an agricultural university operating from the Ministry of Education has further contributed to its funding difficulties, mission orientation, and lack of contacts with the agricultural community. The primary concern now is to harness this rich resource base in a more productive direction. BAU, despite its recent political and economic problems, has the potential to improve its research and training programs across all its disciplines and excel in selected areas.

Bangladesh Agricultural College (Dacca)

The BARI College was formed in 1938 as the Bengal Agricultural Institute during the days of British India,and remained the only school for higher agricultural education in the country until the creation of BAU. Although the university affiliation of the college has shifted from University of Dacca to BAU, programs are offered in 13 established college departments which lead to a 4 year program at the baccalaureate level and a token masters' effort. The annual admission is about 150 with an average overall enrollment of approximately 450-500 students. Approximately 60-80 students graduate annually and they generally have had little problem obtaining employment within government and the autonomous organizations. The college is administered by the Bangladesh Agricultural Research Institute (BARI).

The college has also had its share of the chronic institutional problems endemic in Bangladesh such as inadequate and/or tardy financial support, lack of supplies and equipment for its laboratories and workshops, antiquated facilities such as the library, and low salaries for professors. The loss of 10 acres of demonstration field sites for public construction, limited land space and urbanization of the area has had negative consequences on the incentive and academic environment. Significantly, the creation of BAU practically dissipated any continued donor assistance to the school. The development of an instructional facility from Dacca to the new BARI complex at Joydebpur appears a number of years away.

Bangladesh Academy of Rural Development (BARD) is part of the Integrated Rural Development Program (IRDP) which is under the authority/control of the Ministry of Local Government, Rural Development and Cooperatives.

The Academy, with locations at Comilla and Bogra, was established in 1952 to train agricultural cooperative and local government officers and staff. It was also mandated to conduct research on administrative problems and methods for promotion of rural development. The Academy built its program around the concept that to bring about rural modernization required changes in the most important institutions for which the people organize their activities. This focused on:

- the establishment of new cooperative systems;
- the reorganization of local government to prepare for the needs of development;
- the creation of training institutions to meet educational needs.

The following types of courses are now conducted at the Academy:

(a) Pre-Service Training for IRDP Officers: BARD is responsible for the basic training of IRDP field staff, primarily of the three officers who direct the IRDP program in IRDP thanas (The Thana Project Officer (TPO), the Deputy Project Officer (DPO), and the accountant. Recently, the basic course for TPO's and DPO's was reduced from 6 months to four months. Shortages in field staff and scheduling programs have been given as reasons for this change.

(b) In-Service Training for IRDP Officers: BARD organizes in-service training for TPO's and accountants on a variety of specialized subjects.

(c) Training of Thana Central Cooperative Association (TCCA) Staff. BARD assists in training TCCA officers. The four-month course is designed for upgrading skills of the 1,000 TCCA officers throughout the country. Specialized, short-term courses are also offered.

(d) Management Training for TCCA Personnel is offered in a specialized seven-day program. BARD also assists in organizing similar courses at the district level.

(e) Training of Thana Officers. BARD organizes short courses/seminars for groups of thana officers from all Ministries.

(f) Training of Elected Local Government Officers and staff at the local level, including the thana and union.

(g) Training of Managers of Village Societies and Model Farmers at the TTDC.

The Academy conducts survey research on relevant rural economic and sociological issues, and Action Research through Pilot Projects.

Associated with BARD, Comilla, is the Cooperative College (Comilla) which focuses on training of field inspectors in pre-service and in-service courses. It has 8 zonal training institutes which conduct short orientation courses to members of cooperative societies and TCCA Village Accountants.

The Agricultural Extension Training Institutes (AETI):

Intermediate level staff of the Directorate of Agriculture are trained at 12 Agricultural Extension Training Institutes (Gauripur, Sherpur, Tajhat, Gaibandha, Natore, Daulatpur, Tejgaon, Sylhet, Ishurdi, Faridpur, Chittagong, and Barisal). About 900 students are enrolled in the Institutes annually after Grade 10 for a two-year pre-service training course. Approximately 400 diploma graduates are produced a year. Enrollment per institute averages about 125.

Building facilities vary widely from institution to institution. AETI's at Gauripur and Natore are housed in dilapidated buildings wholly unsuitable and inadequate. The AETI at Tejgaon is engulfed in the urban area of Dacca and has no farm land for practical work or expansion. The AETI at Tajhat requires extensive alterations and/or additions. The AETI, Sylhet, was damaged in the war of 1971 and is still under repair. AETI buildings at Sherpur, Gaibandha, and Daulatpur also require repairs and need to expand facilities. Two AETIs, Tejgaon and Gouripur, each have farms of less than one hectare. Four others have less than six hectares each and only two, Daulatpur and Gaibandha, have 14 hectares each. The AETI teaching staff at each location consists of a principal, 6 graduate instructors and five diploma-level instructors. The majority of the staff have had little classroom training and typically are underpair. Since April 1974, the two-year curriculum was expanded to three years with a planned formula of five months of institutional teaching and seven months of practical field extension work each year.

Other Agriculture Training Programs:

BADC Staff Training Institute, Madhupur (Mymensingh). This Institute is located on the 500-acre BADC seed production farm at Madhupur, 28 miles from Mymensingh. Started in 1970, it has offered a variety of courses ranging from 4 to 90 days in duration for staff, officers and subordinates, in (a) administration and financial management and (b) technical subjects — seed technology, fertilizers, irrigation agronomy, pump repair and maintenance, and horticulture. Approximately 840 candidates participated in the program in 1978/79 and about 2,500 have been trained since its beginning.

Thana Training Development Centers provide continuous training at the level to "model" farmers, UAA/VEO's. In some 250 thanas (or 60% of all thanas), Thana Training and Development Centers (TTDC) provide offices and accomodation for thana level staff, and a hall for farmer training, in accordance with the Comilla model. Some thanas also have a workshop adjacent to the TTDC for irrigation pumps. The TTDC usually includes a tract of land which may be utilized for farming, but it is frequently too small for training purposes. Moreover, the office and residential facilities are usually insufficient for the needs of the 15 to 20 thana staff and most staff complaints concern the lack of accomodation. On the other hand, the training hall is sometimes used only as a godown for fertilizer, seeds, tubewells, pumps and various tools. Training material frequently consists of no more than a blackboard and many TTDCs have no chairs or benches for the trainees.

Training at the TTDC consists largely of lectures by instructors who are thana level officers (mostly the agricultural, irrigation, plant protection, and IRDP project officers). Sometimes district level officers, research staff, and, occasionally, outside instructors are engaged as lecturers. There is no established curriculum or annual training plan. Field demonstrations are minimal because of any number of the following:

- Suitable land is not available
- Staggered growth stage demonstration fields are not laid out and consequently demonstration materials are only available during limited periods.
- Farmer group sizes of up to 150 to 200 preclude any effective instruction, and demonstration.
- The instructors lack practical training in demonstration methodology and experience in field demonstrations.

Those eligible to receive TTDC training are model farmers, cooperative societies' chairman, and TIP pump groups. In some thanas, pump operators and tubewell attendants also participate. Depending on their groups, they are paid a daily stipend of between Tk.3 and 8 for their attendance. As TTDCs provide no housing facilities for trainees, farmers usually walk to the thana headquarters from their homes to attend a 3 hour "class" about once a week.

The TTDC approach for farmer training has merits in densely populated countries like Bangladesh where the center is located within two to three hours' walking distance from most farms. Even through the technical standard of the thana staff may be low, the pooled competence of a large number of thana specialists appears to offer a significantly higher standard of training than the UAA can provide. In terms of motivation, the TTDC seems to be a potentially effective vehicle for providing farmers awareness related to technical improvement and utilization.

Mennonite Central Committee (MCC) has offered training courses since 1970 to farmers, schools, crop production specialists, thana extension officers, and district extension officers. Courses include crops, irrigation techniques, food processing, rural credit, cropping patterns, and data collection. A degree of credibility has been established with the quality of course presentation related to key agricultural problems. The MCC has some effective working linkages with the research institutes, particularly BARI.

BARI's Applied Research and Training Division and BRRI's Rice-based Cropping Systems Program train personnel are skilled in on-farm research methodologies and extension techniques. In addition, training is given to extension agents, district officers, and teachers in rice-based cropping systems.

The Fisheries, Forestry, and Hydrology Institutes also offer a variety of short courses and in-service training programs in specialized subject areas which are designated primarily for narrowly defined interest groups and professionals.

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Introduction

Quite frequently, agricultural research identifies the introduction of new agricultural inputs as the best way to boost the

productivity of cultivators' existing land and labor. Often, as is the case with improved seed varieties, the findings of agricultural research are embodied in these inputs themselves. In other cases, new inputs are identified as necessary for utilizing untapped resources such as irrigation water needed to make research findings pay off.

Clearly, networks for delivering the seed, fertilizer, pump, and pesticide inputs must be in place if the full returns from agricultural research are to be realized. If, at the same time, small poor traditional farmers are to benefit from the research embodied in these inputs, agricultural credit must be readily available until farmers have greater purchasing power of their own.

While further improvements in performance are necessary, in Bangladesh today the development of input delivery services is outpacing that of agriculture research programs. Such heavy investments have been made in fertilizer production and distribution, seed processing and power pump instalation, that the problem now is one of mobilizing research and extension resources to assure that full social benefits from these new inputs delivery networks are attained. The low and widely fluctuating yields recorded from fertilizer and HYV use (see Annex H) and the underutilization of power pump command area suggest that farmers could indeed benefit from knowledge on how and when to use these inputs better.

The wide range of recently produced studies, evaluations, and analyses attest to the importance that the Bangladesh Government and foreign donors give to the effective delivery of production inputs in stimulating agricultural output and promoting rural welfare. This annex summarizes for each of the principal agricultural inputs: a) the procedures of the delivery system as it currently operates; b) the most recent performance levels of delivery of these inputs; and c) major problems and plans for further strengthening of these delivery networks. Criteria for selection of the voluminous material for summarization here has been the relevance of input delivery for implementation of farming systems research and development programs as well as how farming systems research might contribute to better choice of the inputs to be used in agricultural production. The bibliography at the end of this annex lists the most current and comprehensive of these reports for the reader interested in greater detail. Copies of these reports are available in the regional and Washington, D.C. offices of both AID and World Bank.

It is interesting to note at the outset that, with the exception of credit, most studies and evaluations focus on one institution, the Bangladesh Agriculture Development Corporation (BADC) which has almost exclusive responsibility for the distribution of seed, fertilizer, pesticides and power irrigation pumps to farmers. In fact, unlike the proliferation of agriculrural research, training and extension activities

among a range of institutions, agricultural input delivery (and, in some cases, manufacture) has been concentrated in only a few government corporations. 1/ Even more ironical is the frequently heard complaint that agricultural input delivery is too concentrated and measures should be taken to decentralize the activity, particularly to allow more private sector participation.

The general concensus of the input supply system evaluations is that it is too big for one agency to handle alone. There is clearly more room for private sector involvement as well as closer coordination with other government agencies. Where the BDG should begin and how it should proceed to overhaul its input supply system is itself a researchable subject that should also have a farming systems dimension to it.

Improved Seed

Improved seed is one of the vital inputs for increasing crop yields and is an important factor for bringing change in traditional agriculture. Since seeds degenerate after 4 or 5 years, it is necessary to replace the old seeds by new varieties at regular intervals. BADC is entrusted with the task of production and processing of quality seeds and making them available to the farmers.

Cereal Seed Production Procedures

Because physical facilities necessary for production, processing and preservation of improved seeds have been inadequate to ensure supply of quality seeds to the farmers, BADC with the assistance of the World Bank undertook a comprehensive Cereal Seed Project in 1973-74 to modernize and expand facilities and technology for seed production and processing. Under the project two separate schemes, namely, (i) Production of Improved Seeds (Paddy & Wheat) through Seed Multiplication Farms (SMF) and Contract Growers and (ii) Procurement Processing and Distribution of Improved Seeds (Paddy & Wheat) were drawn up and put in operation.

For execution of the Cereal Seed Project, the BADC General Manager is assisted by four managers vis., Manager (Farms), Manager (Contract Growers), Manager (Seed Processing) and Manager (Seed Distribution). At the field level, the overall activities of the SMF are looked after by Farm Superintendents; the farms at Sadhuhati in Jessore and Kashimpur in Mymensingh, meant for production of foundation seeds, are headed by Seed Agronomists.

1/ The BADC, in fact, was formed in 1965 by consolidating under one corporation several separate agricultural input enterprises in order to achieve greater coordination and efficiency in supply to farmers.

At present BADC has 20 Seed Multiplication Farms (SMFs) located throughout the country and ranging in size from 100 acres to 3,000 acres. Total area of these farms is 6,319 acres out of which 5,025 acres are available for cultivation. The farms at Sadhuhti and Kashimpur serve for multiplication of breeder seeds into foundation seeds which are further multiplied into certified seeds in other SMFs and through Contract Growers for distribution to the farmers.

Prior to 1973-74, the Corporation had been executing a program of production of seeds through registered owners scattered all over the country. Effective supervision and proper coordination were lacking. In order to ensure closer supervision, BADC has selected six contract grower zones in the vicinity of SMFs at Thakurgaon in Dinajpur, Paharatali in Chittagong, Itakhola in Sylhet, Madhupur in Tangail, Tebnia in Pabna and Noornagar in Kushtia. The zones are further divided into 20 Seed Units, each with one Supervisor to select the contract growers from among the general farmers and look after their activities. The selected farmers and BADC contract for production of certified cereal seeds.

The Corporation supplies Contract Growers with necessary inputs like fertilizer, irrigation equipment, seeds, credit facilities in cash and kind through BKB, etc. BADC also provides training facilities to the Contract Growers. The Corporation ensures premium price for quality seeds at 20% over the ruling market price. The credit money along with interest is liquidated at the time of procurement of seeds.

Cereal Seed Production Performance

During 1978-79, the SMF produced a total of 15,007 maunds of foundation seeds, comprising 2,540 maunds of paddy and 12,467 maunds of wheat, and a total of 106,778 maunds of certified seeds, comprising 65,672 maunds of paddy and 41,106 maunds of wheat. During the previous year actual production of certified seeds was 108,300 maunds of which 64,744 maunds were paddy and 43,556 maunds were wheat.

During 1978-79, a total of 5,158 maunds of foundation seeds, comprising 883 maunds of paddy and 427 maunds of wheat, was distributed to the Contract Growers for production of certified seeds. Production of certified seeds by Contract Growers was 52,240 maunds of paddy and 62,445 maunds of wheat.

Cereal Seed Procurement, Processing and Distribution Procedures

Cereal seeds produced in SMF and through Contract Growers are procured, subject to seed standards, for processing in BADC's six Seed Processing Plants. After certification by the Seed Certification Agency, seeds are preserved in the BADC seed godowns for distribution to the farmers. Seeds are also procured from abroad when necessary.

Table F-1: Production of Certified Seed by BADC

Name of Crop	1977-78	1978-79
	(On Seed Multiplication Farms)	
Aus		
Local	6,792	6,337
HYV	9,115	9,779
Aman		
Local	9,088	7,288
HYV	22,375	21,375
Deepwater	2,776	2,429
Boro		
Local	302	336
HYV	14,296	18,128
Total Paddy	64,744	65,672
Wheat	43,556	41,106
Total Cereal	108,300	106,778
	(By Contract Growers)	
HYV Aman	9,700	25,650
HYV Boro	13,824	26,590
Total Paddy	23,524	52,240
Wheat	32,500	62,445
Total Cereal	56,024	114,685

Source: BADC, 1978/79 Annual Report.

The World Bank-funded Cereal Seed Project provides for the establishment of eight seed processing plants, one each at (i) Chuadanga, Kushtia, (ii) Dinajpur, (iii) Tebnia, Pabna, (iv) Itakhola, Sylhet, (v) Sadhuhati, Jessore, (vi) Pahartali, Chittagong, (vii) Kashimpur, Mymenshingh and (viii) Madhupur, Tangail. The plants at Sadhuhati and Kashimpur were earmarked for processing of foundation seeds, and the remaining six plants of certified seed. BADC also procured sixteen driers, eight cleaners and eight garders, and moisture meters under a West German grant. As of June 30, 1980 construction of all the plant buildings has been completed and machinery installed and readied for operation.

Construction of seven godowns in seven processing centers with a total capacity of 12,100 tons is nearing completion. The godowns are meant for storage of processed and graded seeds. On the distribution side, the Corporation also has 100-ton intermediary godowns in each district and 20-ton thana godowns, supplied from the intermediary godown and from which seed distribution to farmers is made. For procurement and distribution of seeds, BADC uses private transport to supplement its small fleet of trucks.

Cereal Seed Processing and Distribution Performance

During 1979-80, a total of 83,886 maunds of paddy and 134,770 maunds of wheat seeds were procured from different sources and a quantity of 75,281 maunds of paddy, 68,689 maunds of wheat, 200 maunds of mustard, 300 maunds of groundnut and 17,446 lbs. of vegetable seeds were processed. This distribution of paddy and wheat seeds in 1979-80 was 63,939 maunds and 380,878 maunds respectively. Table F-2 shows trends in the production, procurement and distribution of wheat and paddy seed between 1973/74 and 1979-80.

Vegetable Seed Production and Promotion

To stimulate the production of winter vegetable crops BADC operates four Agricultural Development Estates, one in each division at Dacca (Kashimpur), Chittagong (Patiya), Rajshahi (Pabna) and Jessore (Kotwali). The purpose behind the establishment of the ADEs was to raise farmers' incomes through introduction of modern agricultural methods and improved marketing facilities.

Adaptability trials for introduction of exotic varieties of vegetable crops are also an important feature of the demonstration farms. During 1978-79, 14 new varieties of vegetables and fruits such as Cabbage (Leo 80), Tomato (Rome V.F.), Radish (Chinese), Watermelon (Sugar baby),etc., were tried in the demonstration farms and selected for introduction in farmers' fields. Progress also was made in production of vegetable seeds, seedlings, and grafts of horticultural crops at the different demonstration farms.

Table F-2: Trends in Certified Seed Production, Procurement and Distribution

(Figures in Maunds)

Year	Production	Procurement	Distribution
	(Paddy Seed)		
1973/74	87,139	330,220	239,433
1974/75	77,384	118,596	111,665
1975/76	86,199	101,774	62,127
1976/77	88,823	58,878	30,506
1977/78	127,016	67,349	47,523
1978/79	117,912	83,886	40,109
1979/80	144,375	83,335	63,939
	(Wheat Seed)		
1973/74	12,103	49,575	38,569
1974/75	19,302	49,963	18,086
1975/76	23,205	145,579	124,993
1976/77	32,522	58,697	47,749
1977/78	78,815	116,563	93,524
1978/79	103,551	134,770	130,403
1979/80	297,627	608,071	380,878

Source: BADC, 1978/79 Annual Report, up dated.

Under the agro-climatic conditions of Bangladesh, per acre yields of potato can be raised significantly by using quality seed and other agricultural inputs. In order to ensure a supply of quality seeds to the farmers, BADC also manages the multiplication, preservation and distribution of seed potato using imported foundation seeds to produce certified seed through Contract Growers in a fashion similar to its cereal seed production program. BADC also provides for import of some improved seed potato for distribution to farmers.

During 1978-79, a total of 5,261 maunds of foundation seed potato was distributed to the Contract Growers for multiplication into certified seeds and a quantity of 43,431 maunds of seed potato were procured from the Contract Growers during the year. An additional 44,418 maunds of seed were also imported from Holland and India.

Potato, being a perishable commodity, needs proper preservation. Seed potatoes produced by Contract Growers are procured by BADC subject to seed standards and preserved in cold storage for distribution during the next sowing season. For this purpose, provision was also made for construction of one cold storage warehouse in the potato growing zones. Construction of buildings and structures in all cold storage centers has been completed and machinery and equipment installed. A total of 27,097 maunds of seed potatoes was preserved in five BADC cold storages in 1978-79 . In addition, 16,334 maunds were preserved in private cold storages during the same year.

Table F-3: BADC Procurement and Distribution of Seed Potato
(In maunds)

Item	1977-78	1978-79	% Change
Procurement			
Local	13,522	43,431	(+) 221
Imported	57,596	44,418	(-) 23
Total	71,118	87,849	(+) 24
Distribution			
Local	13,607	32,163	(+) 136
Imported	51,007	48,894	(-) 4
Total	64,614	81,057	(+) 25

Seed Delivery Problems

The earlier problems of limited physical capacity to produce, process and distribute seed to farms is reflected in BADC's program to expand facilities and IBRD's financial support to these efforts. With this new capacity BADC is poised in a position to nearly triple its levels of seed sales to farmers.

Concurrent with the expansion of facilities there has been a shift in the demand for BADC seed delivery services. Farmers once introduced to new seed varieties by BADC and the extension service generally prefer to store a share of their own harvest as seed for the next planting. Thus by BADC estimates farmers meet 90 percent of the rice and 80 percent of their wheat seed requirements from their own stocks. BADC supplies the balance mainly as newly developed seed varieties.

There remains, however, the problem of seed deterioration during on-farm storage. While not directly a BADC concern, the corporation must be prepared to offer a better alternative. This is particularly true in the case of wheat, which must be held longer and is more susceptible to deterioration in on-farm storage. The trends in Table F-2 demonstrate the BADC's shift in recent years from rice to wheat production procurement and distribution. Given the governments' targets for domestic wheat production and the heavy dependence still on imported wheat seed, higher performance will be required in BADC wheat seed production, procurement -- from contract growers -- and distribution activities.

Chemical Fertilizer Distribution

Fertilizer Distribution Procedures

The Bangladesh Agricultural Development Corporation (BADC) is responsible for the procurement of chemical fertilizers and making them available to farmers. Fertilizers received at port and factory gates are moved by BADC to different distribution points located at district and thana levels. The Corporation depends solely on public and private means of transport, such as railway, trucks, coasters, etc., for movement of fertilizer. Retail dealers at the village level make their own arrangements for moving fertilizers from thana centers to their distribution points. The entire cost of movement and transportation including port dues, handling charges, etc., is born by BADC.

BADC also owns and hires facilities to store fertilizers at different vantage points from which the thana stores are continously supplied. Facilities are also required for maintaining buffer stocks, because it takes at least three months lead time to procure fertilizers from local factories and six months from abroad. Buffer stocks are also essential for inaccessible areas which vehicles and vessels cannot reach in some months of the year. During 1978-79, total storage capacity available to BADC was 359,442 tons. Table F-4 shows the detailed storage position on June 30, 1979.

Table F-4: BADC Storage Capacity as of June 30, 1979

Type of Godown	Number	Total Capacity (Tons)
BADC godowns	308	154,000
Transit godowns	4	32,500
Intermediary godowns		
i) 2,000-ton	10	20,000
ii) 1,000-ton	23	23,000
iii) 500-ton	29	14,500
Thana godowns		
i) 400-ton	78	31,200
ii) 200-ton	164	32,800
Hired godowns	827	205,442
Grand Total	1,135	359,442

Under the present system, district allotments are made by BADC in consultation with the Ministry of Agriculture on the basis of trends of past use and availability of stocks. BADC makes fertilizers available at the thana level. The distribution is carried out by BADC-appointed wholesale and retail dealers. Thana Central Cooperative Associations (TCCAs) in and outside the IRDP framework are also wholesale dealers. The retail dealers undertake distribution at farmer level. At the field level, there are : four Divisional Managers; one in each Sub-Division a Sub-Divisional Manager who supervises storage and sale of fertilizers; and at thana level, a Thana Inspector directly responsible for fertilizer sales.

In 1978-79 the Government introduced a new system with a wider participation of the private sector in fertilizer distribution and marketing in Bangladesh. The ultimate objective of the system is to transfer the responsibility of fertilizer distribution to the private sector. The system was introduced in Chittagong Division in September 1978 on an experimental basis, and expanded to the rest of the country subsequently. The main features of the system are:

i) Primary Distribution Points (PDP) roughly corresponding to the present intermediary godowns be established;

ii) Private wholesalers (customers) including cooperatives, companies, etc., be allowed to buy a minimum of three tons of fertilizers from Primary Distribution Points (PDP) which shall not be limited as to the number of dealers;

iii) No license be required for dealership but customers' registration with PDP is necessary; and

iv) The dealers be allowed to purchase a minimum of 20 maunds from thana godowns for sale only within their respective areas.

Fertilizer Distribution Performance

The use of fertilizers has increased from 379,885 tons in 1973-74 to 841,987 tons during 1979-80, registering an increase of 121 percent over 1973-74. Table F-5 shows the trend. Notable is the introduction of DAP in 1978-79. During 1978-79, 388,000 tons of fertilizers (36 percent of total receipts) were received from local factories and 614,000 tons (64 percent) were imported. Local procurement of Urea was 44 percent and imported was 56 percent. About 24 percent of TSP was procured locally and 76 percent (including DAP) was imported. In the case of MP there is no local procurement.

Table F-5: Trends in Type of Fertilizer Sold in Bangladesh

Year	Urea	TSP	MP	DAP	Others	Total
1973/74	267,628	93,821	18,393	-	-	379,842
1974/75	174,195	75,175	17,509	-	12,690	279,569
1975/76	311,926	109,915	22,112	-	13,832	457,785
1976/77	353,320	125,585	22,380	-	11,405	512,600
1977/78	479,846	192,036	41,230	-	5,941	719,053
1978/79	470,556	177,654	46,991	37,748	8,660	741,609
1979/80	535,985	206,187	46,235	42,010	11,570	841,987

Source: BADC, 1978/79 Annual Report, updated; and

Monthly Fertilizer News Letter, BADC.

During 1979-80, a total quantity of 841,987 tons of chemical fertilizers were distributed against the annual target of 1,000,000 tons.

Fertilizer Distribution Problems

Limited financial and physical capacity of the BADC distribution network has continued to plague effective fertilizer distribution. Financial problems derive from the subsidization of fertilizer sales; fertilizers were first sold below cost to stimulate their use by farmers, and this subsidy has been continued.

The sales price of fertilizer per maund prevalent in 1978-79 was Tk.70 for Urea, Tk.55 for TSP and Tk.45 for MP. Now that use of chemical fertilizers has been popularized among farmers, the government policy is to eliminate subsidy on fertilizer gradually. With that end in view, fertilizer sales prices have been reviewed annually and prices adjusted, on the average, about once a year since 1977. With the increase in sale price, the percentage of subsidy has been decreasing but the total volume of subsidy has increased considerably in recent years due to higher cost of procurement and increased consumption. Table F-6 shows per ton subsidies during 1978-79 and 1977-78 respectively. The SFYP calls for further reductions in fertilizer subsidies.

Table F-6: Fertilizer Costs, Prices and Subsidies

Type	Factory or C&F Cost	Distribution cost	Cost to Farmer	Sale Price	Subsidy (Taka)	Subsidy (%)
		(For Fiscal Year 1978/79)				
Urea (Local)	1819.00	744.29	2563.29	1905.40	657.89	26
Urea (Import)	3082.00	744.29	3826.29	1 05.40	1920.89	50
TSP (Local)	4350.00	744.29	5094.29	1497.10	3597.19	71
TSP (Import)	3082.00	744.29	3826.29	1497.40	2328.89	61
MP (Import)	1926.20	744.29	2670.00	1224.90	1445.59	54
		(For Fiscal Year 1977/78)				
Urea (Local)	1734.00	718.24	2452.24	1633.20	819.04	33
Urea (Import)	2981.06	816.11	3797.17	1633.20	2163.97	57
TSP (Local)	4350.00	718.24	5068.24	1306.56	3761.68	74
TSP (Import)	2852.84	816.11	3668.95	1306.56	2362.39	64
MP (Import)	1768.00	816.11	2584.11	1088.80	1495.31	58

The limited level and location of BADC storage facilities has also been identified as a major problem for effective fertilizer distribution. Up to 1973, BADC had 268 constructed godowns having a capacity of only 137,600 tons, or less than two months stocks at current consumption levels. In 1973-74 BADC prepared a scheme for construction of 352 godowns with a capacity of 352,400 tons during the First Plan period. But due to lack of money and materials, no progress was made up to June, 1975. A new program for construction of 70 godowns with a capacity of 69,600 tons was drawn up in 1976. By June 1978, construction of 26 godowns with a capacity of 25,800 tons was completed, and construction of 7 more godowns with 14,000 tons capacity was in progress under the new program.

In order to supplement the construction of godowns under the Core Program, the Government of Bangladesh entered into an agreement with the USAID for financing construction of godowns. The execution of the scheme started in 1977-78 with selection of sites and purchase of land. By June 30, 1980 27 godowns with a capacity of 27,000 tons were completed.

Power Irrigation Pumps

Irrigation water is the life blood of modern agriculture. Crop yields can be increased significantly with the help of irrigation. BADC is entrusted with the responsibility of providing irrigation facilities to the farmers through Low Lift Pump, Deep Tubewell, Shallow Tubewell, and Handpump delivery schemes.

Low-Lift Pump Distribution Procedures

Before the commencement of the irrigation season, the national target for fielding of low-lift pumps is set by BADC in consultation with the Ministry of Agriculture. The national target is then split into district targets on the basis of the trend of use of pumps in the previous years. The district targets are then broken down into thana allotments.

A thana committee headed by Circle Officer (Development) or Assistant Commissioner examines the proposed schemes received from the farmers' groups and recommends the viable ones to the District Approving Authority. BADC's unit/sub-unit officer delivers the pumps to the groups as approved by the District Approving Authority. At the end of the irrigation season, the farmers' groups are required to return the pumps to BADC thana store for servicing and storage until the next season.

The responsibility of operation of pumps in the field lies with the individual farmer groups which are required to arrange operation at their own cost. The manager of the group remains responsible for looking after pumps in the field and returning them to thana stores.

BADC is responsible for maintenance, repair, overhauling and servicing of pumps. For these purposes, the Corporation has built up a network of workshop facilities throughout the country. For field maintenance, the Corporation has 350 Unit/Sub-Units, many located at thana level. BADC employs one mechanic/assistant mechanic for every 15 pumps, who is responsible for field repairs and periodic inspection. For major repairs, BADC has 48 zonal workshops and four regional workshops for the manufacture of some spare parts and for serving as buffer stores for different accessories.

In 1978-79, a total of 9,000 group managers and pump operators were trained at different thana training centers in the field of minor repair and maintenance of irrigation equipment. Similar low lift pump training was given to 360 mechanics/assistant mechanics under an ILO/UNDP training program. In 1979 there were 1,058 mechanics and 1,648 assistant mechanics on the BADC staff for repair and maintenance.

BADC delivers pumps to the farmers' groups for a rental fixed by the Government. In addition, the groups are required to pay for repair and replacement of parts in the field. For supplementary irrigation during the Aman season, rental and repair charges are 50 percent of that for the Boro season. To ensure smooth operation of pumps, BADC supplies oil and fuel to farmers at fixed prices.

Low Lift Pump Distribution Performance

During 1979-80, BADC had a stock of 52,629 pumping sets of which 39,546 were serviceable, 8,075 repairable and 5,008 condemned. A total of 39,000 pumps was made ready for fielding in the 1979-80 boro season. Trends in pump utilization, area irrigated and per pump coverage from 1973-74 to 1979-80 are shown in Table F-7.

During 1979-80, average per pump coverage was 37 acres, compared to 40 acres in 1978-79. The district of Kushtia with 58 acres coverage per pump appeared to be the best user among the districts. The districts that followed Kushtia were Kishoreganj, Jessore,and Sylhet, having per pump coverage of 49, 45 and 44 acres respectively.

Table F-7: Trends in Low Lift Pump Irrigation

Year	Power Pumps (Number)	Total Area (Acres)	Comand Area (Acres/Pump)
1973/74	35,243	1,330,810	38
1974/75	35,516	1,300,507	37
1975/76	36,382	1,323,818	36
1976/77	28,361	1,101,210	39
1977/78	36,730	1,343,670	37
1978/79	35,895	1,433,729	40
1979/80	38,595	1,435,670	37

Source: BADC, 1978/79 Annual Report updated.

Deep Tubewell Distribution Procedures

Since large scale use of surface water for irrigation through low lift pump and other conventional methods may hamper navigation, fisheries, etc., the alternative is to exploit and use underground water through tubewells. The use of underground water is also necessary in acres were adequate surface water is not available.

BADC is responsible for sinking and commissioning of deep tubewell groups, which are required to employ operators at their own cost. For utilization of tubewells, the farmer groups pay a token rental of Tk.1,200 per annum. BADC ensures supply of POL and necessary spare parts at cost. For smooth functioning of tubewells in the field, BADC deploys mechanics/assistant mechanics for repair, overhaul and servicing. At present, the tubewell groups are not required to pay any charge for this technical service.

The work of both DTW and STW is looked after by the officers of the Deep Tubewell Scheme. There are three Circles each headed by a Superintending Engineer, fifteen Regional Offices each headed by an Executive Engineer, 47 zones each headed by an Assistant Engineer and 156 unit offices each headed by a Sectional Officer. For field repair/maintenance of tubewells, there is a mechanic and/or assistant mechanic for each 10 deep tubewells.

Deep Tubewell Distribution Performance

The First Five-Year Plan of Bangladesh envisaged installation of 10,000 deep tubewells including those sunk up to June, 1973. Since inception up to June 1978, a total number of 11,023 tubewells were sunk and 9,484 commissioned. The number in operation by the end of the First Plan was 7,453.

As of June 1980, a total of 11,358 deep tubewells was sunk and 10,552 commissioned. The highest concentration of tubewells was in Dacca district with 1,483 tubewells operating during 1979-80. Other districts that followed Dacca were Mymenshingh, Tangail and Rangpur. The lowest concentration was in Sylhet where only 16 tubewells were in operation.

About 589,043 acres were irrigated during 1979-80 as against the target of 600,000 acres, and a total of 504,340 acres was under irrigation in 1978-79. The achievement during 1979-80 was 16 percent higher than that of 1978-79. The highest coverage was recorded in the district of Mymenshingh with an area of 74,061 acres while it was the lowest in the district of Sylhet with only 1,052 acres.

The country average in respect of per tubewell coverage was 60 acres in 1978-79 as against 54 acres in the previous year. Thus, the per tubewell coverage in 1979-80 increased by 10 percent over the previous year. The district of Kushtia recorded the highest per tubewell coverage with 78 acres, while it was the lowest in Noakhali with 41 acres. Most of the districts exceeded the target of 50 acres per tubewell. Table F-8 shows the trend of operation of tubewells, area irrigated and tubewell coverage from 1973 -74 to 1979-80.

Table F-8: Trends in Deep Tubewell Irrigation

Year	Power Pumps (Numbers)	Total Area (Acres)	Command Area (Acres/Pump)
1973/74	1,494	61,456	41
1974/75	2,699	117,854	44
1975/76	3,828	153,747	40
1976/77	4,461	164,198	37
1977/78	7,453	338,474	45
1978/79	9,329	504,340	54
1979/80	9,795	589,043	60

Source: BADC, 1978/79 Annual Report, updated

Shallow Tubewell Distribution Procedures

Shallow tubewells are generally sunk in those areas where adequate surface water is not available and where transport of heavy machinery and equipment necessary for sinking of deep tubewells is not possible. The sinking of shallow tubewells requires no heavy machinery and equipment and as such financing becomes easier. Broadly, all areas except the coastal belt, Madhupur Tract of Tangail, Savar, Joydebpur and Sripur of Dacca, the Barind tract of North Bengal and the entire Sylhet and Chittagong Hill Tracts are suitable for shallow tubewell irrigation.

Shallow tubewell delivery and installation was handled by the private sector before it was undertaken by BADC. There was also a separate program for sinking of shallow tubewells under the supervision of the Ministry of Agriculture, under which tubewells were sunk at 50 percent subsidy. In early 1972, BADC took over the entire responsibility of sinking shallow tubewells, and for its first two years would sink tubewells free of cost for operation on an annual rental basis. When it was found that the farmers were interested in securing the ownership of tubewells, BADC revised its policy from a rental to a sale program.

Under the new system, shallow tubewells are sold to farmers at prices ranging from Tk.10,000 to Tk.20,000 depending on well depth, engine type and pipe diameter. The individual farmer pays 30 percent of total price as down payment and the remaining 70 percent in 6 half-yearly installments. For groups, the down payment is 10 percent of the price and the balance of 90 percent is to be paid in 10 half-yearly installments. Simultaneously with this system, arrangements have also been made to sell tubewells to the farmers on 100 percent cash payment at a 10 percent rebate.

BADC is responsible for sinking and commissioning of shallow tubewells while the individual farmers or farmer groups are responsible for their operation. The Corporation, however, ensures supply of POL and spare parts at cost and provides technical services without any service charge to the farmers for smooth functioning of engines.

The field offices of Deep Tubewell and Shallow Tubewell Schemes function in an amalgamated way. There are four Regional offices each headed by an Executive Engineer, ten zones each headed by an Assistant Engineer and 40 units each headed by a Sectional Officer. For field repair and maintenance, there are 50 Mechanics and 150 Assistant Mechanics under the Schemes.

To supplement and accelerate the sale of shallow tubewells BADC has received IBRD (IDA) financing for sinking of 10,000 tubewells in 5 districts of Rajshahi Division. This program excludes 4 thanas of Bogra district which are under the Rural Development project and 4 thanas of Pabna covered by the Sirajganj Integrated Rural Developmen Project. The program envisaged sinking of 2,000 IDA financed shallow tubewells in 1978-79 but due to delay in procurement of tubewell materials no tubewell could be sunk during the year.

Shallow Tubewell Distribution Performance

In 1979-80, 11,379 tubewells were operating as against 8,374 operating during 1978-79. Thus, the achievement in operation of shallow tubewells exceeded the actual performance of the previous year by 36 percent. Among the districts, Bogra was the highest user of shallow tubewells with 1,517 shallow tubewells operated during 1979-80, while the lowest concentration was in Barisal with only two shallow tubewells in operation.

During the 1979-80 Boro season, 135,615 acres were irrigated by shallow tubewells as against 81,493 acres irrigated in 1978-79. This marked 53 percent increase over the actual area irrigated during the previous year. The area coverage was the highest in Bogra with 12,979 acres irrigated followed by Mymenshingh and Tangail with 9,988 and 8,570 acres respectively.

The country average coverage per tubewell was 12 acres during 1979-80, compared to 11 acres during the previous year, a 10 percent increase in per tubewell coverage over 1978-79. The highest per tubewell coverage was 17 acres in Jessore followed by Kishoreganj, Comilla and Sylhet with 14 acres each. The per tubewell coverage was the lowest in Barishal with only 3 acres.

The trend of operation of shallow tubewells, area irrigated and per tubewell coverage from 1973-74 to 1979-80 is given in Table F-9.

Table F-9: Trends in Shallow Tubewell Irrigation

Year	Power Pumps (Numbers)	Total Area (Acres)	Command Area (Acres/Pumps)
1973/74	998	4,462	4
1974/75	1,029	6,773	7
1975/76	2,162	12,894	6
1976/77	3,045	17,707	6
1977/78	6,447	58,985	9
1978/79	8,374	88,493	11
1979/80	11,379	135,615	12

Source: BADC, 1978/79 Annual Report, updated

Hand Pump Distribution

Power pumps require high capital investments and complex user organizations which make their access difficult for many small farmers. When in the mid-1970's was discovered that some farmers were irrigating their land with hand pumps supplied by UNICEF originally for potable water purposes, it was decided to initiate a formal program of hand pump production and distribution aimed primarily at crop irrigation. Between 1977 and 1980 the UNICEF/IRDP "Manually Operated Shallow Tubewells for Irrigation" (MOSTI) Program distributed about 90,000 hand pumps over half of which were found to be used for irrigation.

Year	Number to be sold
1978/79	80,000
1979/80	80,000
1980/81	80,000
Total	240,000

However, no handpumps could be sold during 1978/79 due to delay in procurement of tubewell materials. The first hand pumps under the USAID funded program were distributed early in 1980 with a target of 60,000 pumps set for the 1980/81 winter crop season.

Pump Distribution Problems

Both equity and efficiency problems have characterized government irrigation pump distribution programs. Most severe criticisims -- which have even reached the international press -- have focused on the dominance of large farmers in pump distribution schemes. Not only have pumps been installed on the land of these larger farmers but in some cases, it is alleged, favourable terms of financing and rental were also extended to these users. Small cultivators,particularly share-croppers with no land as collateral for financing pumps, effectively have had the irrigation pump spigot shut off to them.

Closely related to equity problems are serious shortcomings in the efficiency of pump use. The average command area of all pumps is well below capacity, due in part to the fact that large farmers, once they meet their irrigation requirements from the pumps they own or control, have little interest in going to the added expense and trouble to furnish water to other nearby cultivators. In some cases the location chosen for pump tubewell irrigation is suited best for the large land owner and nearby higher lands of other farmers could not be irrigated under any circumstances.

The efficiency of irrigation pump use has also been constrained by BADC maintainance and fuel supply policies. Users can only use BADC to service and supply fuel for BADC pumps. But mechanics and fuel have not always been available when these services were needed. Allegedly, some BADC mechanics have abused their positions to extort tips from user groups for repairs to pumps that would break down during critical irrigation periods in crop cultivation. Parts' shortages have also been a problem in keeping pumps working. Larger farmers, able to offer mechanics accommodation and quick payments, were often first to get repairs, fuel and replacement parts. The fragmented land and social patterns of small poor farmers have hampered their efforts to pressure for adequate participation in pump distribution and to organize for effective pump use.

Suggested measures to assure equitable and efficient pump use have included the following:

1. More direct sale of pumps to farmers using private dealers;

2. More rela ed collateral terms for pump financing to permit small cash-short farmers to acquire pumps;

3. Relaxation of the BADC monopoly on servicing pumps to allow qualified private repairmen to supplement BADC mechanics in the field;

4. Electrification of power pumps to remove dependency on petroleum fuel for their use;

5. More emphasis on handpump distribution to farmers with very fragmented land holdings;

6. More research on design of manually operated hand-pumps to permit greater labor efficiency;

7. More extension and research work on on-farm and intra - farm water distribution to expand pump command area.

Various donor programs are in the processes of design and implementation to advance these measures. USAID has programs in credit, rural electrification and handpump manufacture/distribution already under way. The IBRD and ADB are also building more relaxed credit requirements and more private sector participation into their proposed and on-going tubewell irrigation projects. The BDG is toying with the idea of private deep tubewell ownership by farmers for the first time under the SFYP. Still more effort, particularly in ways to expand pump coverage, will be called for before past and planned heavy investments in power pump irrigation can pay off.

Chemical Pesticides

In Bangladesh, pest attacks and various plant diseases take a heavy toll of crops almost every year. Pest control measures have therefore assumed a greater importance in the agricultural development program of the country.

Pesticide Distribution Procedures

Up to mid-1979 BADC procured pesticides and sprayers from local sources such as BCIC, CIBA-Geigy, etc., and also from abroad. At the transit level, pesticides were stored in BADC's own and hired godowns until moved by railway, truck or barges to thana godowns of the Directorate of Plant Protection. After July of 1979 all procurement and distribution of pesticides was to be handled by the private sector in cooperation with the MOA Directorate of Plant Protection. However, implementing legislation and licensing delays initially hampered the private sector from picking up where BADC left off.

Under the new pesticide distribution system the Plan Protection Directorate issues licenses to import particular types of pesticides. The license is renewable after two years. The distribution and sales of pesticides are the responsibility of private companies through their own dealers at the district and thana level. The dealers sell pesticides/ fungicides/herbicides to farmers at retail prices fixed by the Government. The subsidy on pesticides has been completely withdrawn and the government fixes the new retail prices according to estimates of the manufacturing companies.

The Directorate of Plant Protection has two wings: aerial operations and land operations. The existing staffing pattern of the land operations wing is as follows:

Thana level staff

Mukadams	-	1000
Sprayer mechanics	-	428
Plant Protection Assistants	-	428
Total -	-	1856

District Level staff

i)	Plant Protection Inspector	-	24
ii)	Supporting staff	-	202
	Total -	-	226

Headquarters, Dacca

i)	Officers	-	66
ii)	Supporting staff	-	347
	Total -	-	413

The Plant Protection Directorate also has six aircraft for aerial spraying. The aerial spraying is done at the time of epidemic attacks of pests, or to ward off such attacks. The Plant Protection Directorate also performs pesticide use monitoring and pest serveillance work with the help of its thana and district level staffs.

The Plant Protection Directorate has instructed the private companies to pack pesticides in smaller containers so that farmers need buy only enough to meet their requirements. The Plant Protection Directorate and also the private companies train the dealers as well as farmers to take precautionary measures in handling pesticides. Particularly they are cautioned about the contamination of food with pesticides.

Pesticide Distribution Performance

During 1978-79, targets were fixed for procurement of 1,612 tons of pesticides and 5,000 hand sprayers. 1,700 tons of pesticides and 5,000 hand sprayers were actually procured. Table F-10 shows trends in BADC

procurement of chemical pesticides and sprayers since 1974/75. The downward trend in these procurement figures is a reflection of the gradual withdrawl by BADC from distribution of this input. Moreover, under BADC, pesticides like fertilizers were heavily subsidized. New pesticide prices under private procurement and marketing arrangements have jumped in some cases by 300 to 400 percent which has understandably dampened farmers' demand.

Table F-10: Trends in Procurement of Pesticides and Sprayers

Year	Pesticides (Tons)	Sprayers (Numbers)
1974/75	4,924	12,400
1975/76	2,693	10,500
1976/77	3,207	400
1977/78	2,697	6,000
1978/79	1,700	5,000
1979/80	-	-

Agricultural Credit

The limited purchasing power of small, poor farmers has been identified as a serious constraint to acquiring the seed, fertilizer, water and pesticide inputs required to boost their agricultural productivity. Traditional sources of borowing - wealthy landlords and family friends -- have limited capacity relative to total requirements or, in the case of money lenders, impose onerous conditions which often leave borrowers with few benefits. Improvements in the supply of institutional credit have been undertaken as a means of overcoming this problem.

Credit requirements that must be met from institutional sources are large, however. It is calculated that cultivation of an acre of land employing modern inputs requires a cash outlay of about 1,500 taka or U.S. $100.00 at today's prices (See Annex G).1/ A land area of 30 million acres under rice or wheat in 1980 (at a cropping intensity of 1.5 million acres), if entirely "modernized" would require a capital outlay of nearly U.S. $3,000 million to be financed by formal or informal sources or by farmers themselves.

1/ Returns of course are also high. Yields of about 50 maunds (1.7 tons) per acre at 90 taka/maund of paddy will generate US $450 or about US $300 per acre after payment of cash costs which yields $200 to cover family labor and land rental plus a margin of profit.

In comparison, in the 1979/80 crop year there were roughly 900 million taka or U.S. $60 million extended by the national banking system for short and medium term production credits, an amount that could reach only 600,000 acres, or less than 2 percent of the cultivated area. Even given the importance that self-financing and informal borrowing will continue to play in agricultural production, it is clear that institutional credit has a way to go in catching up with requirements.

The Agricultural Credit System

In Bangladesh, the provision of agricultural credit is undertaken by a range of government agencies and farmers' cooperatives which work together under the general leadership of the Bangladesh Bank (BDB), the country's central banking institution. Based on credit requirements estimated from the value of agricultural inputs to be supplied farmers, and crop production targets set by the Agricultural and Planning Ministries, the Department of Agricultural Credit of the BDB establishes levels of lending for each banking institution. In so doing the BDB takes into account each bank's capital assets, and where appropriate lends additional sums at between 6 and 8 percent interest.

Table F-11: Agricultural Credit Institutions and Branch Agencies

Banking Institutions	Branches			
	100 C.	Actual	Planned	Total
BKB	172	172	85	257
BJSB				
Central	62	62	-	62
TCCA	33	33	-	33
KSS	30,165	30,165	-	30,165
CLMB	16	16	-	16
IRDP				
TCCA	200	200	200	400
KSS	22,929	22,929	-	22,929
NCB's				
Solali	309	603	100	703
Pubali	138	273	127	400
Uttara	n.a.	123	n.a.	123
Rupali	173	369	100	469
Agrani	247	511	n.a.	511
Janata	275	506	225	731

Source: Nathan, 1978

To stimulate agricultural lending by the banking system, the government launched a 100 crore taka (U.S. $66 million) agricultural credit program in 1977. In that year, only about $20 million was lent for agricultural production. In 1979/80 the annual lending had risen to about 90 crore taka or U.S. $60 million. Further expansion of the agricultural lending to about 250 crore taka or $125 million is planned during the SFYP. The following banking institutions have been involved in the government's agricultural credit program.

Bangladesh Krishi Bank (BKB)

The BKB is the government agricultural bank set up with the sole mandate of extending crop and livestock loans to farmers. Most lending has been short-term though some medium term lending, mainly for power pump acquisition, has been included recently. In 1978 the BKB had over 172 branches throughout the country, many at the union level. The BKB has understandably been the largest participant in the government's 100 crore credit program,.

BKB agricultural disbursements in 1976/77 were 3,884,000 taka as compared to 1,357,000 taka in 1973/74; loans outstanding had also risen during the period from 6,822,000 taka in 1973/74 to 8,867,000 taka in 1976/77. Of these amounts in 1976/77 under the 100 crore taka program BKB disbursements were 1,610,000 taka and outstanding loans were 678,000 taka.

The Nationalized Commercial Banks (NCB's)

There are six nationalized commercial banks in Bangladesh, all of which are participating in the governments' 100 Crore program. The decision to include the banks was based on their records of sound financial performance as well as on their presence in many rural areas through growing numbers of branch agencies which supplement those of the BKB. See Table F-11. These banks receive and re-lend BDB agricultural credits at rates slightly higher than those of the BKB.

The rate of annual agricultural disbursements of the NCB's rose from an insignificant 550,000 Taka (about U.S. $35,000) in 1973/74 to 3 million Taka (U.S. $200,000) in 1976/77. At the same time outstanding loans rose from under 300,000 taka to 2,250,000 taka. Under the 100 crore taka program the NCB's as of December 1977 had lent 4 million taka and had 2.7 million taka outstanding.

The Agricultural Cooperative Banks

The Bangladesh Jatiya Samabaya Bank (BJSB) is the apex bank of the traditional cooperative system. Credit disbursed by the BJSB is channeled

to farmers through a very large network of affiliated cooperative organizations that in 1979 included:

16 Cooperative Land Mortgage Banks;

62 Central Cooperative Banks;

33 Thana Central Cooperative Associations (TCCA's) and 30,165 Krishi Samabaya Samities (KSS) village Cooperative societies;

62 Fishermans' Central Societies and 4,172 Fishermans' Primary Societies;

82 Central Cooperative Multipurpose Societies; and 4,123 Multipurpose Cooperatives;

12 Central Sugarcane Societies and 759 Primary Sugarcane Societies.

The task of the BJSB has been largely to allocate and to account for funds distributed through this vast network of local cooperative organizations. Working with limited staff and narrow margins, the entire cooperative system has been plagued with decapitalization and limited supervisory and advisory capacity over its members. Loan disbursements of the BJSB had grown to about 120 million taka or U.S. $8 million in 1978 and though operations appeared to show a profit in all years, overdue accounts have been running at a dangerously high 33 percent.

The Integrated Rural Development Program (IRDP)

Almost parallel to the BJSB, the IRDP, also under the Ministry of Local Government, Rural Development and Cooperatives overseas the operation of 200 Comilla-style TCCA's and 22,929 affiliated KSS's with a total membership in 1979 of about 700,000. Annual lending has fluctuated around 30 million taka or U.S. $2 million annually, an average of U.S. $3.00 per member. Extremely high loan delinquency rates, reportedly ranging above 50 percent of advances (Nathan, 1978 p.61) have been largely responsible for the failure of the program to expand its lending activities.

Credit Delivery Problems

Difficulties in achieving equitable distribution of agricultural credit and a financially solvent national banking system have been identified and are being addressed by the USAID-sponsored Rural Finance Experimental Project (RFEP). Early RFEP results have helped document suspicions about the failings in the existing credit system and have identified possible approaches to their solution. The most significant findings are summarized here:

1) Interest rates and bank solvency. The low subsidized interest rates are not adequate to cover the cost of credit to banks and at the same time pay operating expenses and leave a cushion for defaults. Higher rates are needed to pay the higher salaries and logistical costs of delivering credit in rural areas.

2) Interest rates and farmer profits. Farmers normally require credit only for purchase of cash inputs which total about half of their production costs -- the other half being the imputed value of their family labor. A doubling of interest rates from between 12 and 18 to 24 and 36 percent represents only a 6 to 9 percent increase in their total production costs. Costs and returns surveys show farmers can absorb these cost increases in the value of added output that is possible from inputs punchased with credit. Moreover, farmers have not been reluctant to borrow and pay back credit at these higher rates, demonstrating by their own calculations and performance that fully costed credit pays.

3) Collateral and defaults. The fear has proven unfounded that lending to farmers with no collateral to offer as security would lead to high default rates. The major culprit in high default rates has been poor supervision in selecting borrowers and monitoring their performance. The added bank revenues generated from higher interest charges, it is believed, can be used to employ more credit agents at better salaries that will stimulate the supervision of agricultural credit needed to keep default rates and bank losses at a minimum.

4) Credit and complementary services. Even well-managed credit delivery programs cannot make banks more solvent and farmers more productive if the technological packages and production inputs are not also in place. The need for more profitable crop production packages is evident from the still relatively low yields and low returns experienced among credit users.

Agricultural Input References

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BADC 1977 — Recommendation of National Workshop at Madhupur on Problems of Fertilizer Marketing and Distribution at Small Farmers' Level, BADC March 8-10, 1977 (Draft).

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Irrigation Pumps

Note: Power irrigation pumps are supplied and financed by the BADC with some delivery through the IRDP . There are also large canal irrigation schemes for delivery of water to about half million acres which are managed by the Bangladesh Water Development Board. Only studies on delivery of manual and power irrigation pumps are listed here.

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Economic Viability Analysis

Introduction

The output of agricultural research is increased knowledge about how best to combine productive resources of land, water, labor and capital to produce more goods desired for consumption and sale. This knowledge can be combined in inputs (e.g. improved seeds) supplied farmers, or it can be transmitted as recommendations through extension media on how to alter production conditions (e.g. via irrigation or fertilizer applications) or how to adjust cultivation practices to "fit" local conditions better (e.g. crop rotations, tillage rates, plant population densities). Because what is technically feasible on the research station may not always be economically viable in farmers' fields, it is necessary to constantly monitor the performance of cultivators to assess the pay-off of new technologies as a guide for further research efforts.

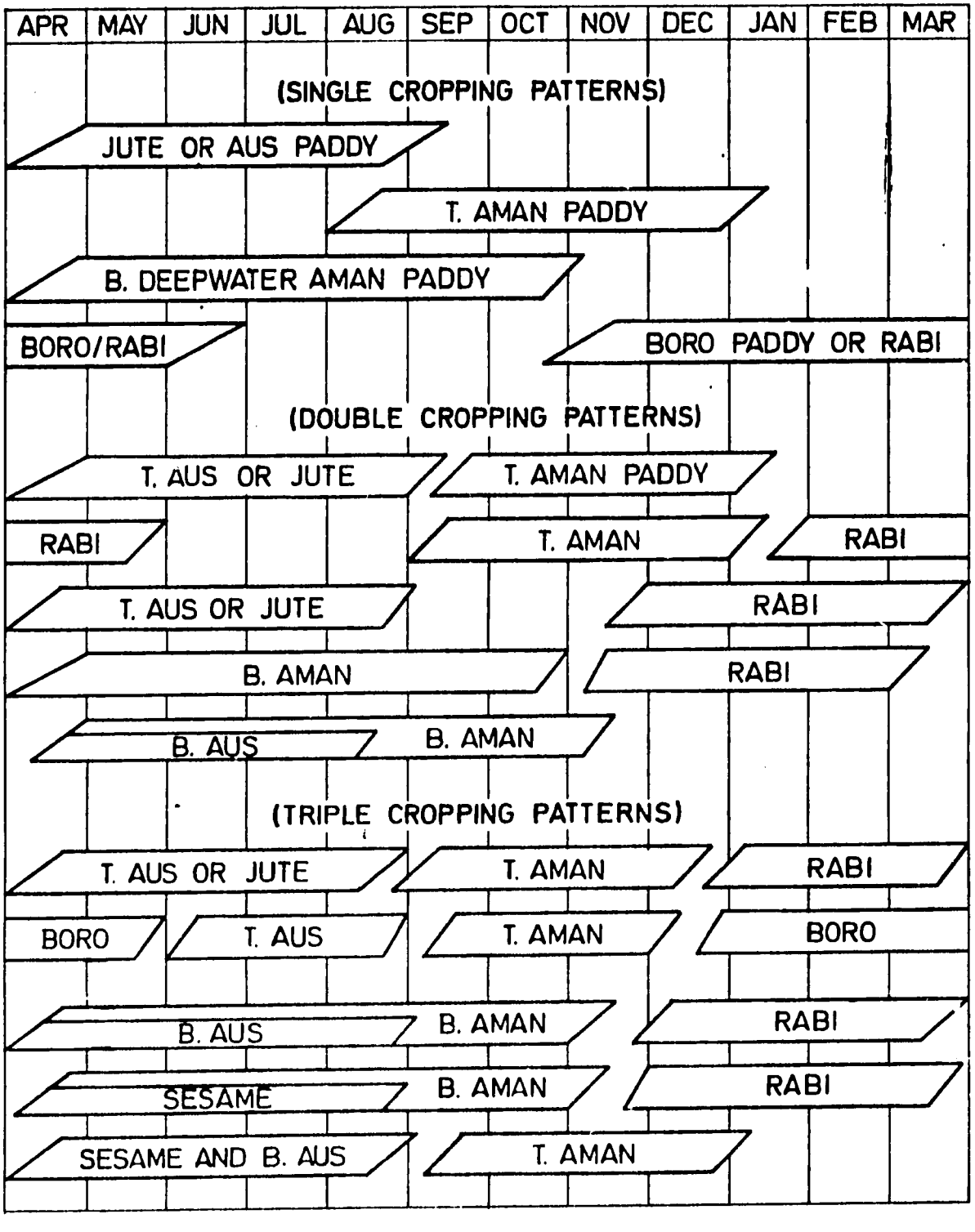
Beginning in early 1978, USAID began to undertake periodic farm-level surveys to assess the performance of cultivators of different farm sizes and tenancy arrangements using "HYV technologies" assisted by AID-funded fertilizer and credit inputs. These surveys were continued in an expanded form with the Ministry of Agriculture, Planning Cell in 1979 and with the recently established agriculture economics divisions of BRRI and BARI in 1980, where hopefully this work will continue in the future. Copies of reports published so far are listed at the end of this annex.

The farm-level surveys collected data on the cultivation practices, costs and returns associated with the crops that make up the principal cultivation patterns of farming systems in Bangladesh. These principal cropping patterns are illustrated in Figure G-1. In the case of grains, data were collected on traditional (local) and improved (HYV) levels of technology in cultivation.

The cropping patterns in Figure G-1 illustrate some of the cultivation alternatives open to farmers in Bangladesh. Of course, on many soils agronomic conditions may dictate which of these patterns is technically feasible given the current state of the art available to farmers. Still there is ample room for choice among cropping patterns and practices based on economic considerations. One of the best known of these choices occurs during the early monsoon season when the acreage planted to jute and aus paddy fluctuates from year to year according to the relative prices of these two crops. Another more recent example is the impressive expansion of wheat acreage during the dry season at the expense of other irrigated and rainfed dry season crops.

FIGURE G-1

CALENDAR OF MAJOR CROPPING PATTERNS IN BANGLADESH[1/]



1/ RABI CROPS INCLUDE: WHEAT, MAIZE, MILLET, POTATO, MUSTARD, LINSEED, GRAM, GRASS PEA, SUNFLOWER, GROUNDNUT and TOBACCO.

Source: BRRI, Cropping Systems Division, 1980.

The Survey Findings

Given that economics does influence farmers' decisions to shift among crops and from one technology to another, it is worthwhile attempting to identify how crops and levels of technology rank according to criteria that farmers might be expected to take into account. The crops included in Figure G-1 were ranked in Table G-1 with other crops and/or levels of technology for the same cultivation season according to five economic criteria that would be expected to have some bearing on farmers' decisions regarding which to cultivate. These four criteria are the following:

a) Returns Per Acre. Returns per acre in terms of gross incomes were calculated using the yield data and the prices prevailing at the time the farmer sold the bulk of his crop.

b) Cash Costs of Production. These are calculated in taka per acre for the total costs of inputs purchased by the respondents. (See Tables G-2 and G-3). It is assumed here that in calculating their cultivation costs farmers give little weight to the market prices of labor, bullocks and manure supplied by themselves and their family members, since the costs of these inputs to the owner are lower than their market prices. Thus "full-cost" valuing family-supplied inputs at prevailing market prices over-estimates their actual cost. "Cash-cost" calculations of what farmers actually pay out of pocket probably guide their decisions more than "full-cost" calculations.

c) Labor Days. Total hired and family labor figures are used in the analysis. Data were collected in days and hours and then coverted to the nearest tenth of a day in the analysis. Wages used in calculating labor costs were based on prevailing hired labor wage rates adjusted for the inputed value of meals paid.

d) Returns to Family Labor. When gross income after payment of all cash expenses is spread over the number of days of family labor employed in cultivation, it is possible to compute the returns to a day of family labor and land invested in crop production. When compared to the prevailing wage rate, returns to labor provide an indication of whether it was truly profitable to cultivate the crop or whether a family would have done as well by hiring its employable members out, assuming work for a comparable number of days at the prevailing rate could be found.

Table G-1: Economic Rankings of Selected Crops and Crop Technologies

Crop and Level of Technology	Gross Income 1/ Amount	Gross Income 1/ Ranks	Cash Costs 1/ Amount	Cash Costs 1/ Rank	Employment Days	Employment Rank	Returns to Labor 1/ Amount	Returns to Labor 1/ Rank
(Aman Rainy Season)								
Local T. Aman	1824	3	510	2	100.4	2	23.05	2
HYV T. Aman	2776	1	829	3	123.2	1	33.06	1
B. Aman	957	4	257	1	49.7	4	18.47	4
B. Aus/B. Aman	1994	2	836	4	98.8	3	20.00	3
(Aus/Jute Monsoon Season)								
Local B. Aus	1263	5	324	1	79.8	5	18.36	5
HYV B. Aus	2396	2	434	2	92.4	4	35.15	1
HYV T. Aus	2792	1	868	5	112.0	1	29.69	2
Jute Capsularis	2142	3	536	3	104.8	2	26.80	3
B. Aus/B. Aman	1994	4	836	4	98.8	3	20.00	4
(Boro/rabi Dry Season)								
Local Boro	4469	6	951	5	183.1	4	26.96	7
HYV Boro	3272	8	1881	13	183.7	3	11.19	11
Wheat	1668	11	1135	7	93.4	8	8.64	13
Chilli	5532	5	1295	8	228.4	1	21.17	9
Radish	7534	2	1408	9	162.1	5	45.75	4
Cabbage	6461	4	1488	10	91.5	9	71.35	1
Sugarcane	3913	7	1854	12	93.7	7	53.62	3
Watermelon	2539	10	1039	6	57.7	11	26.09	8
Brinjal	6880	3	1756	11	117.6	6	60.86	2
Groundnuts	2556	9	815	4	73.9	10	40.02	5
Potatoe	7700	1	2799	14	224.4	2	28.38	6
Mustard	881	12	282	3	39.9	13	17.99	10
Barley	205	14	257	2	44.1	12	-1.55	14
Mosur	478	13	205	1	32.7	14	9.82	12

1/ Amounts in taka per acre for "Gross Income" and "Cash Costs" and taka per day for "Returns to Labor"
Source: USAID/Bangladesh Costs and Returns Surveys.

Table G-2: Selected Crop Cultivation Costs and Returns Per Acre

	Broadcast Local Aus	Transplanted HYV Aman	Irrigated Wheat
Yield (maunds/acre)	15.8	34.7	21.5
Returns per acre			
Gross income (taka/acre)	1,263	2,776	2,301
Price (taka/maund)	80.00	80.00	107.00
Total costs of production (taka/acre)			
Full-cost basis	1,023	1,632	1,588
Cash-cost basis	324	829	1,033
Cost per maund (taka)			
Full-cost basis	64.74	47.03	73.86
Cash-cost basis	20.50	23.89	48.05
Net income (taka/acre) 1/			
Full-cost basis	240	1,144	713
Cash-cost basis	940	1,947	1,268
Benefit/cost ratios 2/			
Full-cost basis	1.23	1.70	1.45
Cash-cost basis	3.89	3.35	2.23
Returns to family labor			
Net income (taka/acre) 3/	940	1,947	1,268
Family days worked	51.2	58.9	36.1
Returns to labor (taka/day)	18.36	33.06	35.12
Wage rate (taka/day) 4/	8.87	9.12	9.75

1/ Gross income less total costs.
2/ Gross income ÷ total costs.
3/ Cash-cost basis.
4/ Average wage rate of different cultivation activities.

Table G-3: Selected Crop Costs of Cultivation Per Acre

(Values in Taka)

Item	Broadcast Local Aus	Transplanted HYV Aman	Irrigated Wheat
Labor	509	864	621
Hired	222	498	271
Family	287	366	350
Bullocks	381	433	213
Hired	-	-	51
Family	-	-	162
Seed	57	33	284
Manure	43	56	43
Fertilizer	29	147	266
Urea	19	90	160
TSP	8	38	83
MP	2	19	23
Pesticides	4	21	5
Irrigation	-	78	156
Total cost per acre			
Full-cost basis	1,023	1,632	1,588
Cash-cost basis 1/	324	829	1,033

1/ Total Cost less cost of family labor, family owned bullocks and manure.

When ranked against each other the crops surveyed show some interesting patterns for each of these criteria. In the case of gross income the high-value high-technology high-yield crops (e.g. transplanted HYV's, radish, cabbage, potatoes) lead the other crops in performance. These "big pay-off" crops are the ones looked to by agricultural planners and researches to boost food output and farm income. Why then are they not being grown more extensively?

One answer might lie in an examination of the cash-costs required to grow each of these crops. An entirely different pattern emerges when these crops are ranked according to criteria of which has the lowest cash costs and hence imposes the least financial burden and risk on cultivators. Now low-technology low-yield crops come out on top. The figures in Tables G-1 and G-2 show, for example, that to move from low to a high technology crop cultivation cash outlays may increase three to five times. To the extent that cash is a constraint, the adoption of high technology crops will be delayed.

Table G-1 shows that the high technology crops as a rule also have greater labor requirements and consequently rank highest as regards employment opportunities. From a national standpoint higher employment opportunities are an added attraction to promotion of these crops. However, the crop surveys have revealed that small cultivators often could not supply all needed labor from family sources alone — particularly during peak periods of plowing, transplanting and harvesting — and had to hire labor to get the job done. The added cash expense of hired labor further constrained their capacity to expand area under these crops.

A further insight into choice of crop technologies can be obtained from the relative rankings on the basis of returns to labor. The prevailing day wage during most of the survey period ranged between 10 and 14 taka per day, and, in a few instances, as high as 20 taka per day in areas close to urban industrial centers and at some peak periods of cultivation activity. By comparison returns to labor were higher than prevailing wages for the aman and aus season crops and for most of the rabi/boro crops. One notable exception is wheat which had low returns to labor largely because of low yields, attributable to the unfamiliarity of this relatively new crop to many cultivators. There is some evidence that low wheat yields are attributable to excessive tillage which reduces soil moisture and retards germination. It is instances such as these where the absence of production technologies suggests further research effort is required.

In fact, the crop surveys revealed that as a rule yields reported by farmers fluctuated widely around the mean values used in calculating gross incomes and returns to labor presented in Table G-1. These widely fluctuating yields suggest that farmers, while willing to try out new crops and production technologies are experiencing difficulties in managing them in such a way as to assure reasonable returns. In short the right technologies and the right instructions in their use are not reaching farmers.

When in fact farmers do succeed in fitting high technology crops into their farming systems the pay-off can be significant. After payment of all production factors including family labor at inputed local wage rates, high technology (transplanted HYV) aus, boro or aman paddy and improved wheat and most vegetable and oilseed crops produce a net return in excess of 1,500 taka (US $ 100) per acre above the net returns experienced from cultivation of traditional (broadcast local) varieties. With nearly 10 million acres of traditional paddy acreage available for conversion from local varieties to HYV's when technologies with the right agro-economic "fit" are developed, there is a potential annual pay-off of about one billion dollars or about 10 million tons of additional grain at stake. Future realization of this magnitude of benefits — which is net of the cost of purchased inputs — will be a function in large measure of the investments made during the next few years in research to develop the missing technologies.

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Social Soundness Assessment

Introduction

Because the intent of the Agricultural Research Phase II Project is to establish more effective institutions to meet local needs by creating the linkages between research personnel and their farmer clients, a social assessment of the project must examine not only the social organization and cultural patterns of the rural population, but also the relations between an educated elite of agricultural scientists and bureaucrats, on one hand, and low-income, small-scale agriculturalists on the other. Improving the linkages between an urbanized, modernized and educated group of specialists and ordinary farmers is the key to effective implementation of this project.

The basis for this social soundness assessment is primarily the limited number of good-quality community studies carried out in Bangladesh in the past few years. Additionally, studies from other similar rural environments in South Asia have been consulted as well as standard works on agricultural extension practices and innovation diffusion.

The Agrarian Social Setting

Bangladesh is overwhelmingly rural, densely populated and extremely poor. Its agriculture is characterized by heavy emphasis on rice, small fragmented landholdings and growing landlessness and declining rural real income.

A population growth rate of 2.8% per year is placing increasing strains on the social fabric as well as on the productive capability of the country. Since there is virtually no new land to be put into cultivation, and since Bangladesh has few other resources, improvement of productivity on existing land, through effective adaptive agricultural research, is one of the few avenues of development available at this time.

In the rural setting where nine out of ten Bangalis live, 85% are dependent directly or indirectly on agriculture. Towns are few; markets are small; communications and transport, especially during the rainy season, are difficult. Four out of five Bengalis are illiterate. Transmission of "modern" ideas and techniques, therefore, depends heavily on personal contact.

The Farm Household

The typical farm household consists of a father, his grown sons, and their offspring, and, perhaps, cooperating brothers. As described elsewhere, the farmers' adaptive strategy is complex, based on a relatively large number of scattered plots, held on a variety of tenure terms, with a large array of crops and crop varieties closely fitted to the vagaries of a difficult environment in such a way as to ensure a subsistence "floor" with minimal risk at low levels of capitalization.

This form of agrarian system has evolved over many centuries in Bengal; recent pressures of population growth and the commoditization of land now threaten its stability. Nearly half of all rural households are functionally landless, according to the AID-sponsored Land Occupancy Surveys; marginal (less than 1 acre) and small farmers (with 1.0 to 2.5 acres) must supplement their farm earnings with intermittent off-farm employment. With the decline in rural real wages and standards of living, increasing numbers of women are augmenting family income through wage labor as well.

The Rural Community.

Beyond the homestead (bari) of extended family members, rural Bangladesh is composed of hamlets and villages. While villages are usually named and have some corporate economic, political, and ritual functions, they are relatively unstructured and weakly organized. Beyond the village, the lowest level of official administration is the union these are grouped together into thanas and districts where most government officials and services are located. There is little ongoing involvement of ordinary villagers with government. With only marginal contact between farmer and government, official transmission of extension information or research findings poses an extremely difficult task because social and political infrastructure for doing so is presently insufficient.

The Government Agricultural Scientist

Though no systematic research on the characteristics and functioning of agricultural scientists exists in Bangladesh, there is information available on their background and motivation. Since they are gazetted government servants, and have received an expensive advanced education, it is likely that the majority of government agricultural scientists come from relatively well-to-do families which can both afford the educational expenses for their sons or daughters and the loss of their labor directly on the farm.

More importantly in the hierarchic and status-conscious culture of Bangladesh, agricultural scientists, by virtue of their social background and their present occupation, represent an educated elite which often is at some pains to differentiate itself from the ordinary rural villagers by dress, residence, consumption patterns, and other symbolic means. Moreover, they subscribe to values and norms of modern scientific knowledge, and are conditioned, by the very fact of their having received scientific training, in the understanding of the "proper" ways to conduct research and advance in their profession.

Judging from past performance in Bangladesh and in similar South Asian settings, agricultural scientists tend to: a) conduct research that aims at professional audiences, rather than farmers, especially poor farmers; b) concentrate on high-status crops rather than the staples of the poor; focus their activities in the relatively more comfortable, and more easily controlled environments of the research station and laboratory rather than farmers' fields; and c) view themselves as part of a larger, cosmopolitan, professional group rather than primarily engaged in outreach to convey information to peasants. (Chambers 1980).

Sociocultural Compatibility of the Project

The Agricultural Research Phase II Project has been designed to take into account the above socio-cultural features of small farm households and government research scientists which, if ignored, could reduce its effectiveness. Specifically, measures will be taken by the project to remove the physical, procedural and cultural barriers to project implementation.

Physical Constraints.

The environmental diversity and difficulties of physical movement in the countryside will be met through establishment of well-equipped regional stations tied into the central facility and by provision of transport to facilitate researcher and staff travel in rural areas. Rather than emphasizing jeep-type vehicles, which though conferring status are subject to misuse and moreover convey inappropriate impressions to rural people, emphais is placed on motorscooters, motorcycles and bicycles which have lower prestige but are adequate for the task required.

The Complexity of Farming Strategies.

The farming systems research approach, outlined in Annex K, is designed specifically to assist in the analysis of complex farm strategies and to suggest appropriate interventions to increase productivity in situations such as found in Bangladesh. Implementation of this approach will require not only formal training for agricultural scientists, but also a new set of values and norms within the research system. This, in turn, will require shifts in the system of rewards for workers and a changed concept of career development and work behavior which is directed toward a clientele composed of low-income, uneducated rural farmers.

In addition to the institutionalization of the Farming Systems approach, the Agricultural Research Project provides for both local and expatriate social science technical assistance, which is to examine specific aspects of an out-reach oriented agricultural research system in Bangladesh.

The Status Gap between Researcher and Farmer.

This issue remains the most serious to be faced, and the most difficult to resolve, of all those mentioned. As Chambers (1980: 2-4) notes, an outreach-oriented agricultural research in hierarchic, status-conscious societies requires reversals of common professional tendencies. Recognition by the scientist that the "undereducated" farmer -- who has managed a subsistence living for centuries on often marginal land -- often knows more about his own situation than the scientist, and can be a resource for solving farming problems. This reverses the view of the "educated" scientist as superior, and calls for a degree of humbleness hard to find among professional elities.

Appropriately managed, farming systems research can improve knowledge concerning complex farming strategies, and enhance awareness on the part of farmer and scientist that they can participate effectively together in dealing with important problems.

Chambers also notes the need for evolving more appropriate methods of appraisal, which can provide reliable data without the long delays associated with conventional surveys. Again, increased mutual participation, at the farm level, can build up not only data but knowledge and bases for judgement, which in turn can result in more appropriate forms of research. This is most effectively done in settings which are not artificially controlled but natural. To the extent that agricultural research under this project takes place in farmers' fields, and despite the physical and research difficulties it may pose, the more productive it is likely to be. (Chambers 1980:4).

A further issue regarding the sociocultural compatibility of this project is the question of how research findings, including those from farming systems studies, are to be transmitted beyond their immediate institutional surroundings. Through a variety of mechanisms, including training of extension workers, development of training modules for subject - matter extension specialists, and dissemination to other agricultural agencies of research findings, the Project will seek to broaden the scope of its impact within the country. This is particularly appropriate now, when under World Bank auspices a serious attempt is being made to install a Training and Visit System of agricultural extension, following a model which has been successful in other parts of South Asia. The serious potential short-comings in the T&V approach are in having something to provide staff which is better than indigenous practices and, being able to communicate credibly with a significant number of potential farmer clients.

Research findings generated through Farming Systems approaches, which will rely significantly upon farmer input and related to actual farm situations, will provide more, and more credible training material to extension workers. Their impact as influences, and opinion leaders, should be enhanced concomitantly.

Social Impact: Equity Issues

According to a number of studies in South Asia, (Chambers,1980) most farmers see little of extension personnel. The ratio of such personnel, especially subject - matter specialists or skilled agricultural

experts, to farmers is extremely low; even lowest level workers are often only on a ratio of one agent to several hundred farmers. This, of course, assumes that posts are filled and employees are actually on hand.

Moreover, many observers have pointed out that field extension staff give preferential attention to large and wealthy farmers, who are in a position to assist the field person with lodging, food, entertainment, and recommendations for promotions in exchange for advice and first chance at scarce resources supplied through the field agent's institutional channels. This, in turn, reinforces the attitudes of small farmers and the poor regarding the nature of their relationships with government agencies -- that such agencies are, if not pernicious, irrelevant to the lives of ordinary people.

Most studies of innovation diffusion point to other farmers -- i.e., those of similar background and equal or slightly higher status -- or relatives as main sources of information and emulation in adoption of new elements or practices. The role of the extension agent, typically, has been ineffective, and that of the research scientist more distant still from the practical facts of subsistence farming.

This distance has been maintained, too, by the stress placed on crop-oriented research rather than adaptive field systems research. Concentration on crops has been at the expense of involvement with farmers, a situation which a shift to a farming systems approach is intended to rectify. To do so, however, the new approach must be carefully explained and organized within the research organization, and appropriate incentives must be offered scientists to enable then to re-orient their work towards more responsive types of research.

In the design of this project, criteria are established to select only that adaptive research which will relate to small, low-income farmers, typically cultivating fragmented holdings. Equal care will be given to making it clear that what is to be demonstrated is the value of new agricultural interventions and not the social status of the farmer participant. This will be difficult not only for the researchers, who will have to overcome deeply-felt class biases in favor of larger, wealthier and more influential farmers, but also for farmers themselves who tend to see the benefits from demonstrations as patronage benefits competed for in political terms.

Providing such resources to poorer farmers is, in the context of extreme scarcity found in Bangladesh, a political act, and not simply a disinterested scientific one. Enlisting the aid of local influentials, and not alienating them while directing attention to those less socially prominent, will require not only interpersonal skill on the part of the researcher but sound and effective support for him on the part of his institution.

Equity considerations also require attention to the role of women in the project, as participants and as potential beneficiaries. Several women are already employed in professional positions in BARC, BARI, and other affiliated institutions. Since the BDG reserves 10% of its positions for women, it is expected that additional women will join these institutions as positions become available. Increased participation by women in more responsible jobs will also be encouraged by enforcement of already existing government regulations requiring such involvement.

Provision for research on home vegetable crops in this project will ultimately have impact on women as laborers and as consumers. At this point it is difficult to determine the magnitude or direction of this impact, since the diversity of both crops and domestic circumstances is extreme. It is highly likely that, as productivity increases due to dissemination and acceptance of research findings, women will find their workload increased as they process and prepare larger volumes of produce. However, this may ultimately be offset by the nutritional and income benefits which they may receive.

Spread Effects: The Diffusion of Innovation

Due to the nature of the Agricultural Research Project, many effects which might otherwise be considered indirect are seen as directly related to project outputs. Since it is the objective of the project to establish a functioning, viable institutional system for agricultural research, successful implementation should result in better varieties of crops, a wider range of crops, higher productivity, improved income for low-income farmers, and improved general nutrition in Bangladesh. Since each of these results is itself complex, predicting indirect effects in detail is difficult.

Employment

Improved cultivation and greater intensity of cropping should generate greater employment opportunities over larger portions of the year. This should affect the income of landless and near-landless agricultural labor, as well as farm operators themselves. In addition to on-farm labor, opportunities may arise for off-farm work in agricultural produce handling, transport, and processing. Since much of the processing work is the province of very poor women, the poorest segment of the population should receive some benefit from the successful institutionalization of this project.

Value of Agricultural Property.

One consequence of the impact of "Green Revolution" seed varieties elsewhere has been the increased profitability of agriculture, and the acceleration of land sales by the poor and land acquisition by the well-to-do. There is evidence that during the last decade the number of land sales in Bangladesh has increasing rapidly and the price of land has escalating as well. (Khan 1977:159). If the results of agricultural research are geared predominantly to relatively capital-intensive farming, this process could accelerate. The project, on the other hand, by working to improve the income of smaller, lower-income farmers, will reverse the process of differentiation of richer and poorer, and its accompanying social polarization.

Migration

Related to the preceding paragraph is the rise in migration in Bangladesh which has accompanied the shift from tenancy to hired agricultural labor by larger farmers and absentee landlords, and the sale under economic pressure by smaller farmers who then either remain as agricultural labor or seek their fortune elsewhere. As low-cost techniques and crops are disseminated and utilized by smaller farmers, the possibility of remaining in farming and on the land will become more attractive to them, lessening this source of migration. And, with smaller farmers becoming more competitive, agricultural labor may become scarce and the terms of their hire more advantageous to them. However, given the current level of population and its growth rate, the impact -- indirect or direct -- of this project on this factor in the near term is likely to be small.

The Role of Women in Agriculture

Although Bangladesh women are engaged in a range of agricultural pursuits, they have not yet been explicitly integrated into the country's agricultural planning and development. Because the tasks performed by women are unpaid most of their work is not regarded as gainful employment in the traditional economic sense. They have consequently been left out of development and extension programs.

Agricultural Activities of Rural Women

The subsistence farm unit is based on a strict division of labor according to sex. Role assignments are complementary and well understood--the man's role is that of paddy grower, the woman's that of rice processor (WFWRSG, 1979 and Chen, 1977). Female, rice processing activities include:

a) Threshing (Marai) which is done most often by bullock, or using feet. The woman's responsibility includes the preparation of the threshing floor which must slope from the center outwards and must be treated with cowdung and mud clay and then dried;

b) Beating (Molon) is a laborious task whereby grains are separated from the stalk, by women beating them over a hard wooden surface;

c) Parboiling (Shiddho) is done prior to and facilitates husking by putting paddy in boiling water and steaming it in a special type of oven (chula).

d) Drying (Shukano) is generally done in the courtyard where the grain is spread out in the threshing yard which is first cleaned and a cowdung/water paste is used to bind the dust.

e) Husking (Bhana), the most arduous work, is done either by dheki or kahail (hand operated husker). In dheki a heavy wooden beam is suspended by a fulcrum horizontally placed between two vertical posts, and is balanced so that when women

depress it the beam descends into the grain. It is generally operated by two women while a third, usually an older woman, does the sifting. There are three stages of husking--the first removes only the outer skin, the second removes the next layer, and the third stage leaves the rice ready for consumption. The wastage of paddy husks are used to feed the poultry and livestock.

f) Winnowing (Jhara, Urano) is the separation of husk and dust from the kernels of grain and is performed both before and after husking using a kula (winnowing fan).

g) Sieving (Challa) is done after threshing as well as after husking as straw and kernels are separated through a riddle, generally this by older women in the household.

h) Storage methods vary from area to area with rice for consumption, seeds and sale being kept separately. Where rice is grown on a large scale small huts are built in the middle of the courtyard or at the back of the homestead of bamboo covered with mud. In the case of subsistence households bamboo baskets (gola) or big earthen vessels (matka) are used for grain storage. Storage, a laborious process which requires much expertise and skill to avoid air pockets in the grain containers, often involves male household members as well.

Besides rice processing activities women are also sometimes involved in seed-bed preparation and maintenance--not only of paddy but also of wheat, pulses, and oil seed crops. They process and store these other crops as well. Their work load includes not only all the pre-planting and post-harvest activities of food grains but also garden cultivation of fruits, vegetables and spices, and animal husbandry including cattle, poultry and ducks. Other tasks performed by rural women can include fuel and water gathering, implement making, house repairing and fish net making.

Implications for Agricultural Research

The wide range and variety of agricultural activities performed by women present ample opportunity for research as regards improved

technologies, better nutrition and more suitable food preparation and preservation.

1. Improved Technologies. According to one study (Farouk, 1975) rural women spend about 12 - 14 hours daily on income-generating activities and expenditure saving activities at home as well as on household chores. Whether or not women have spare time for involvement in other activities is a question which merits further exploration. A substantial part of the unnecessary workload might be alleviated by use of simple technologies. If the workload is not alleviated by some appropriate homestead technology women may be saddled with additional responsibilities as production increases with improved farm practices.

The preplanting and post-harvest operations of rural women in Bangladesh should be studied closely. Improved technologies are needed to equip women to process the larger food crops expected in coming years. Working conditions can also be improved for women who are traditional threshers, huskers, dryers and storers. Appropriate technologies should be devised to make parboiling, drying and husking more efficient and with less loss to nutritional content. These new technologies, however, must make sense in the rural environment and economy and should not displace women's productive work. Possible areas of investigation and experimentation include:

a) Drying: There are many constraints to the drying process of food grains due to weather, especially for aus and boro paddy crops. Technical experimentation could include use of solar dryers or central drying sites for communal use.

b) Threshing and husking: Both are arduous and time-consuming. Alternative technologies such as pedal threshers could be tested.

c) Storage: Storage capacity and loss pose major constraints on the preservation and sale of food grains and seeds. Not only is there loss in storage due to rodents, rot, etc., but limited storage capacity prevents the farm family from storing paddy in order to sell when the price is high. Storage techniques for various crops should be identified and improved.

d) Seed multiplication and preservation: It is women who are responsible for storing seed so as to assure high germination and low disease rates. New technologies should be devised which utilize these traditional female skills and expertise.

Vegetable Cultivation for Improved Nutrition (ADAB, 1980)

It is unfortunate that three nutritionally inferior vegetables - radish, eggplant (brinjal) and bottle gourd - together comprise one-half of the total production of homestead (bari) vegetables of the country. This situation exists because of a general lack of awareness of the nutritional aspects of the vegetables grown and an absence of efforts to plan production and consumption of nutritionally rich vegetables. In Bangladesh stress has always been laid on the production of cereals, and as a result the production of roots, tubors and vegetables is so low, it is almost impossible to provide the population with a nutritionally balanced diet. There is considerable potential, however, for expanding cultivation of Rabi vegetables, those grown in the winter and spring. (See Table H-1). At present, rabi crops make up two-thirds of the total vegetable production of the country and can be divided into:

a) Roots and tubors: These include carrots, knol-khol and turnip which are nutritionally superior to the popular radish;

b) Leafy vegetables: Leafy vegetables are particularly high in Vitamins A and C. Many rural diets are deficient in these vitamins. Among leafy vegetables cabbage and spinach are grown but amaranthus and lettuce are ignored. In fact, amaranthus (lalshak and data) is a local, leafy vegetable which is superior even to spinach in terms of protein, iron, vitamins B and C and iron, and equal to it in terms of vitamin A. Increased production of amaranthus is, therefore, highly recommended;

c) Beans: Two local varieties of beans - country beans (sheem) and asparagus beans (barbati) are nutritionally rich in terms of protein, calorie, vitamins A and B and iron, and are grown, even on marginal lands;

Table H-1 : Nutritional Composition (per 100 gm) of Rabi Vegetables of Bangladesh

Vegetable	Dry matter %	Energy %	Protein mg	Iron mg	Carotene (Vitamin A) microg	Vitamin of B group mg*	Vitamin C mg
Tubers and Roots							
Carrot	14.0	48	0.9	2.2	1,890	0.66	3
Knol-khol	7.3	21	1.1	0.4	21	0.64	85
Turnip	8.4	29	0.5	0.4	0	0.58	43
Radish (White)	5.6	17	0.7	0.4	3	0.58	15
Leafy Vegetables							
Amaranthus (tender)	14.3	45	4.0	25.5	5,520	1.53	99
Spinach	7.9	26	2.0	10.9	5,580	0.79	28
Cabbage	9.1	27	1.8	0.8	1,200	0.55	124
Lettuce	6.6	21	2.1	2.4	990	0.72	10
Beans							
Country Bean	13.9	48	3.8	1.7	187	0.86	9
Barbati							
Other Vegetables							
Tomato	8.9	23	1.9	1.8	192	0.48	31
Cauliflower	9.2	30	2.6	1.5	30	1.14	56
Brinjal	7.3	24	1.4	0.9	74	1.05	12
Pumpkin	7.4	25	1.4	0.7	50	0.60	2
Bottle gourd	3.9	12	0.2	0.7	0	0.24	0

* Total of thiamine, riboflavin and niacin.

Source: From "Rabi Vegetables for Nutrition" by Kamal Uddin Ahmad, ADAB News, October 1980

d) Other vegetables: Eggplant which is nutritionally much poorer than most other vegetables occupies the foremost position in terms of acreage and total production. The bottle gourd, also nutritionally inferior finds a fairly high place in production efforts. It would be more desirable to put stress on tomatoes and sweet potatoes as nutritionally superior and higher yielding vegetables.

Rural women already play an important role in homestead vegetable production preparing seed and vegetable beds, fertilizing plants, raising seedlings, transplanting, weeding, irrigating and harvesting. As mentioned previously, rural women are also responsible for selection, drying and storage of seeds of both vegetables and fruits. Support and extension of agricultural services and training of women farmers in horticulture and nutrition will be a first step in recognizing the role they play and in increasing their productivity and efficiency.

Food Preparation and Preservation (WFWRSG, 1979)

Indigenous methods of food preparation and preservation which are employed by rural women include:

a) Various types of rice products: Chira (beaten rice), muri (fried rice), khoi (puffed rice) and various types of sweets like moa and murki;

b) Pitha, and indigenous type of cake specially cooked with milk, gur (unrefined sugar) coconut and new rice during autumn and winter seasons;

c) Achar (pickles), made out of mango, tamarind, berries and olives which are pickled and preserved;

d) Dried mango (aam satta) made out of ripe mango pulp and juice spread and dried under the sun during the late summer months;

e) Gur and mollasses made out of date-palm syrup and sugarcane;

f) Salt is prepared by a special process in the coastal areas of Bangladesh by both men and women;

g) Honey collection is done by men but some women engage in its preservation and storage;

h) Herbal medicines used to treat common diseases are prepared by rural women.

Modern, scientific methods of canning and bottling are not used in the rural area. Food preservation techniques such as drying vegetables and salting fish could be introduced to make optimal use of these products beyond their peak seasons.

Conclusions

Available data on the role of women in agriculture is scanty. Such papers that do exist are limited in geographic coverage and population sampling. They are at best only descriptive, lacking detailed analyses of the work of female farmers. Policy-relevant data is needed concerning:

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

2) How they do it--time budgets;

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

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

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

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

In order to generate this information the research capacity of female social scientists must be supported and strengthened. In addition, more women must be trained in the social sciences and directed towards research concerning the activities of rural women. The information generated must flow then to policy makers and to extension staffs (Chen, 1977).

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Project Beneficiary Profile and Selection

Project Beneficiary Profile

While the characteristics of Bangladeshi farmers range as widely as the micro environments in which they live and cultivate, it is still possible to give a fairly succint socio-economic profile of those to whom the project is directed. The relevant features of the farmer beneficiary profile are the following:

Limited land access. The USAID-funded Land Occupancy Survey (Januzzi, 1977 and 1979) revealed that 75 percent of Bangladeshi rural households -- about 9 million out of 12 million rural families -- owned 2.0 acres or less of land; of these about 14 percent owned no land at all but had to lease land to cultivate and another 30 percent took in land to supplement their own in order to produce enough to meet their food and expenditure requirements. Farms are commonly fragmented into a number of small plots sometimes separated by some distance (BRRI, 1980, p.35). It is to the cultivators of these small fragmented farms that this project will be targeted.

Limited land Use. Over 60 percent of the farm population (by acreage) cultivate only one crop a year on their land; 30 percent cultivate two crops and 10 percent cultivate three crops for a national average of 150% cropping intensity (BBS, 1979, p.161). Most cultivate at least one rice crop, with the exception of sugar-cane cultivators, and if there are additional crops cultivated during the year, they are usually a monsoon rice or jute crop/or a dry season irrigated or rainfed rice, wheat, vegetable, oilseed or pulse crop. This project will focus on farmers with the potential to increase the intensity with which their land is used.

Limited input use. While modern seed, fertilizer, pesticides and credit are gaining in popularity, most farmers still do not use them or do so only in limited amounts in relation to the requirements of modern cultivation. Only one out of five acres of land cultivated by farmers is sown to HYV seed (BBS, 1979, p.165). While about two out of three farmers were using chemical fertilizer on their crops subsequent surveys have revealed that average dosages are very low (Januzzi, 1979 and IFDC, 1980). Bangladeshi farmers irrigate only two out of ten acres of land they cultivate (BBS, 1979 pp.162-4). Even fewer farmers apply chemical pesticides or use institutional sources of credit to finance their cultivation. The growing numbers of small farmers receiving modern inputs are in a position to gain from research findings on how to use those inputs most effectively.

Uneven labor utilization and productivity. While a farmer and his family are able to provide a fairly even supply of labor through-out the cropping year, the demand for this labor is highly variable; there are some seasons when no cultivation takes place and other seasons with peak periods of labor demand for which a single farm family cannot mobilize enough labor to, say, transplant, weed or harvest a crop (BRRI, 1980, P.29). Such farmers stand to benefit greatly from the adoption of cropping patterns, input mixes and cultivation practices which will permit them: a) to use their family labor and limited capital more productively throughout the year; and b) either to supplement their labor at peak times (using, say, mechanical weeders or line sowers) or to generate for them the cash they need to hire temporary labor.

Low productivity of land and labor. Crop yields among Bangladeshi farmers in recent years have averaged about 0.5 to 0.8 tons per acre for local paddy, 1.2 to 1.5 tons for HYV T. Aman, and 0.5 to 0.7 tons for wheat (BBS, 1979, p.167 and 174). As shown in Annex G yields of some of the HYV paddy crops have even declined over the last decade, and only the shift from local to high yielding varieties has sustained many farmers' output. Not only, then, is there potential to increase the productivity of project participants' land and labor by increased cropping intensity but also by increasing single crop yields as well.

Subsistence or deficit cultivation. Assuming a minimum daily rice requirement of 16 ounces or one pound of rice per family member per day, a family of 9 members requires 9 pounds of rice per day, 63 pounds per week and over 3,000 pounds or 1.5 tons a year. This represents 2.5 tons of paddy which at the average yields cited above requires between 2 and 3 acres of land to produce on a single crop basis. To meet family consumption requirements at these yield levels farmers must either lease in land or double or triple crop their current acreage. Moreover, to maintain even existing low levels of productivity, farmers must apply organic or chemical fertilizers and for this they must sell a portion of their crops to obtain cash, thus further limiting what is available for family consumption. Because small farmers are most often caught in the low-productivity low-consumption trap, they will benefit most from research designed to boost their production.

Low literacy. Few farmers can read or write which greatly constrains their capacity to obtain information on new farming practices using traditional (western) means of extension literature etc. (BBS 1979, p.78). In this environment, field demonstrations and farmer word-of-mouth often promise greater effectiveness in

spreading new technologies. Farmers' reliance on verbal rather than written communication, in fact, appears to make them willing, if not eager, participants in field trials and field surveys, as they are anxious to inform field workers of cultivation problems. Moreover, small farmers, because they more often cultivate the land themselves promise to be particularly suitable project participants.

Project Beneficiary Selection

Of course, farmers fitting the above profile coexist alongside -- and to varying degrees often under the control of -- wealthier farmers who, because of their larger land holdings and capital assets, are able to live quite comfortably by Bangladeshi standards. The role of these well-to-do farmers in village social and political structures and as land leasors, money lenders and suppliers of water resources has been well documented in recent literature cited in the Social Soundness Analysis of this Project Paper. (See Annex H). While larger farmers will not be excluded from participating in the benefits of agricultural research, the success of this project will be optimized only if it is targeted to the farmers profiled above. Large farmers can share in small farm technologies; but small farmers cannot always adopt large farm practices.

The process for reaching the target farmer population is built into the design of the project, as described in Section I.C.2 of this Project Paper. The design incorporates explicit measures for selecting target farmers as direct participants as well as identifying and tailoring of component technology research activities to meet target farmer conditions and needs. The following are illustrative of criteria to be considered in selecting the target farmers as project beneficiaries.

Criteria #1. Initial selection of farmers will be on the basis of major soil, water, flooding and socio-economic conditions where the principal cropping systems of Bangladesh are now practiced.

Justification: 1) The spread effects of new farming systems technologies will be greatest in these areas; 2) The existing inventory of agricultural research findings is greatest for the most common soil types; 3) National agricultural research institute field stations are located in the more common areas and offer, where more than one station is involved, greatest scope for inter-institutional collaboration in farm systems research.

Selection Procedures. Detailed land use and cropping systems maps developed in the 1970's are of sufficient detail and reliability (See Review Team Report p.121) to permit BARC and the national research institutes to identify major areas to concentrate initial farming systems research. Further soil type selection will be made on the basis of available soil specific research findings and location of field station facilities.

Criteria #2. Where component technology research through on-farm trials involves the purchase of modern inputs, project beneficiaries will be selected who are located in areas where adequately developed input delivery networks, particularly for credit, are in place or can be mounted concurrently with project implementation.

Justification: 1) Without these services the project's initial and potential participants will not be able to adopt component technologies needed to up-grade their farming systems; 2) There is evidence that in areas where delivery systems are already in place, inputs supplied to farmers are not being used in productive ways due to lack of research/extension guidance in their use; the result is that the heavy investments in institutions to deliver inputs are yielding low social rates of return.

Selection Procedure. Agro-economic site surveys will identify locations where both: a) there is evidence that seed, fertilizer, pesticides, mechanical irrigation can be important inputs in farming systems development; and b) networks for delivery of such systems are in place. Farm-level surveys will assess farmer recipients' capacity to adopt new inputs; farmers with high receptivity and some capacity of their own to acquire inputs will be given preference along with receptive farmers of more limited means in areas where institutional credit services are available and accessible.

Criteria #3: On-farm-trials will be conducted largely with farmers owning and operating two acres of land or less, exceptions will be based on conditions where only larger land areas are required for economically viable family farming.

Justification: 1) These farmers make up the bulk of the target population; 2) These farmers have unique small-farm problems -- e.g. seasonal variability in demand for family labor and cash constraints for purchasing inputs; 3) Farmers of this size more often cultivate the land themselves, and hence are in a better position to view and assess field trial results than larger farmers who more often hire labor to cultivate their land (See Annex J). Other small farmers are more disposed to adopt new technologies when they see them adopted successfully on farms and under constraints similar to theirs.

Selection Procedure. Benchmark surveys as part of survey site selection will identify farmers of the target size groups. Follow-up surveys of farmers' attitudes toward adoption, risk, organization and cooperation will be used to select those most disposed to collaboration in on-farm testing of new agricultural technologies.

Criteria #4: Landless tenant farmers will be selected for on-farm field trials participation only on a specially designed test basis.

Justification: 1) While everyone recognizes the need to address the problems of landless tenant farmers, assistance through agricultural research has more limited scope and requires greater focus; 2) Tenant farmers, because of their tenuous -- often only seasonal -- ties to the land are reluctant to participate in new farming systems that often involve adoption of year-round cultivation or "whole farm" practices; 3) Land owners capture much -- often half -- of gross benefits of new practices adopted by tenant farmers while incurring none of the costs; if inputs associated with new farming systems have high costs, then owner-cultivators capture even larger shares -- up to 80 or 90 percent -- of the net benefits leaving little for tenant farmers to cover their risks.

Selection Procedure. Baseline surveys will identify landless tenant farmers; farm-budget surveys will identify component technologies -- e.g. minimum tillage needs, better manual weed control, cultivator owned line-sowers or manually operated pumps -- which either, a) have a low cost so at not to reduce net benefits, or b) represent a capital investment that can be retained by the tenant farmers regardless of whose land they till.

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Farmer Survey Supervisor's Field Report

Mahabubar Rahman
CARE/Kashimpur
May 1979.

Introduction and Sample Procedures

This monograph is based on field experiences which I have gathered during surveying some farmers at the BADC Kashimpur * Estate where CARE is cooperating in promotion of winter crops cultivation. Four field staff of CARE-Kashimpur started the survey on 7th May, 1979 in their respective blocks.

Earlier it was decided that farmers names from a previous survey would be used to select respondents. The previous survey, titled "Kashimpur Project Survey" was limited to KUSS** members only and was done in April 1977. As we decided to select our respondents for this present survey from that previous project survey, our selected respondents were all KUSS members. It was decided that 10% of the total KUSS members would be taken as respondents and of this 10% sample, 20% should be taken from under 1 acre land owners, 60% between 1-3 acre land owners and 20% from above 3 acre land owners. Accordingly we got 87 respondents.

Field Experience

It was hoped that a surveyor could survey four respondents per day. But on the first day none of the four surveyors were successful to survey this many. Two of them surveyed 3 respondents each while the others surveyed only 2 respondents each. On the third day of the survey one surveyor even returned without filling up a single questionnaire.

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* The Bangladesh Agricultural Development Corporation (BADC) in addition to its fertilizer and seed distribution activities, manages lands of large estates abandoned by their owners following independence. The land is now owned by small farmers who receive organization help, power irrigation water etc from BADC.

** KUSS = Bengali acronym for Farmer's Union Agricultural Cooperative.

Some surveyors reported transport problems. They would go to a particular KUSS and when they don't get any respondent, neither principal nor alternative, they did not go to the next KUSS. They argued that in the hot sun it was quite difficult to walk several miles to the next KUSS. While they could hire a rickshaw from office to a particular farm site, after that they had to walk; moving KUSS to KUSS is not possible by rickshaw.

As the work, was becoming slower day by day, I understood that a person sitting in an office could not understand, or check, these problems faced by the surveyors. What I was doing in the first three days of survey is that when they deposited the filled up questionnaire, I only checked the mistakes and ommissions made by them and ask them to make that corrections. I did not understand the time needed to have a survey completed.

As it was necessary to complete the work as soon as possible, I, myself, started surveying since 15th May and in 4 days I have filled up 17 questionnaires. The following are my own experiences:

1) Respondents often were not available: It has been mentioned earlier that our respondents were selected from the KUSS member lists which were made during previous survey in 1977. However, after revisiting respondents, I found that: (a) some had died (e.g. Solu Roy of Kashimpur Naya para), (b) some had become completely landless; (c) some had emigrated; (d) some lived outside of village for service or business purpose and come home occassionally, (e) some were so old that they have no connection with lands and his son, with whom he eats, operates his lands, (f) some members were never related with lands, and only as they are educated their names were taken as member in place of their illiterate cultivator father or brother.

Time of day was critical in locating respondents. Morning hours were found to be the best time and after the 15th of May, the survey staff have followed this way. The respondents who were cultivator, as well as day labourers were not available during day time at all. They are available only before sun-rise or after sun-set. If they worked in the same village we could easily get them at their master's house. But if they worked outside of the village they remained almost unavailable and in that case we had to take alternative candidate.

2) Respondents were generally cooperative. I found all of my 17 respondents co-operative and friendly. They did not hesitate to spare time. They were not biased. It was reported that in one Block a respondent did not give real information. He thought this will increase land tax. In every Bangladeshi village there are 2 or 3 men who are never cooperative and find profit or harm in this kind of survey.

I met several villagers who were asking me whether CARE would give them any help/loan or insure their crops. One respondent told me that in one year ha had insured his watermelon with CARE and due to hail storm he got Tk. 1,460.00 to cover his loss. Anyway, I have made all of my respondents clear that none will get any help/loan/loss due to this survey. Regarding cooperation of the respondents, other staff reported to me that only few were not cooperative or willing to spare time.

3) Who made a good respondent? I found that marginal farmers were good respondents. They cultivated small amounts of land and remembered what they did on the land. They could give accurate information on labour, fertilizer application etc. The farmers who were not dependent upon hired labour were also good respondents. They had direct contact with the land and so they knew how much they spent on which land.

On the other hand, those farmers, who used hired labour, were not good respondents. They depended upon their permanent labour (Rakhal in Bengali language) and so couldn't landwise or crop-wise give input expenditures. For example, one of my respondents had permanent laborer and depended upon him. He cultivated Brinjal and when I was asking him different questions on it, he could not give me right answers, and consequently was feeling shy.

4) Few farmers kept cultivation accoun I met only two respondents who kept accounts of when they spend how much on which land. This included their cash expenditures only. They did not count their own labour or their family labour as a cultivation cost.

5) Special observations/comments on survey questions:

a) Cultivated area: As I did not have any opportunity to make a thorough discussion on all of the questions of the questionnaire I have made a gross mistake on this point. I asked and have noted

respondents total amount of cultivable land, but this would have been 'total area cultivated this season'. This mistake I noticed on the morning of 20th May. But all surveyors made the same mistake and this could be rectified only after returning to all of the respondents.

b) By-product weight: Nobody weighs output of by-product and even they couldn't give its value. So what we noted were completely surveyors' and respondents' estimates.

c) Product prices: Some respondents could give the price which he received this year. Usually farmers sell the commodities in different times, so it was not possible to tell per maund sold price as the market goes up and down from time to time. Therefore, in most cases I have noted total price he had received this year. When people carried their commodities by rickshaw or bullock or river boat or truck or by labour they had to spend a certain amount on transport. I noted the amount the respondent has spent and also noted whether this amount should be deducted or not from the sale price.

d) Seedlings produced: Farmers usually grow their seedlings for all plots of the same crops in the same bed. They never count how many seedlings are produced. They never count in bundles and again bundle size varies from farmer to farmer. Bundles they sell are several times smaller than bundles they use. Moreover, seedlings given to friend are not given in bundles. It is the friend or relative who himself has to root out the seedlings from the bed. And owner gifts his seedlings after meeting his own demand. He never counts extra seedlings.

e) Seed use. Amount of seed they use on bigha (.33 acre) of land:

Crop	Seed amount
Cabbage	4 tola
Tomato	8 tola
Radish	40 tola
Turnip	16 tola
Watermelon	3 tola
Brinjal	6 tola
Bitter gourd	152 tola
Wheat	15 seer
IRRI	6 seer
Sugarcane	10,000 prices, each of 1 food long.
Groundnut	12 seer.

f) Harvest and post-harvest: During harvesting time some farmers hire labour on special or contract basis making wages calculation impossible. As for example the laborer gets by-product of groundnut in lieu of threshing. Usually neighbourhood poorer women or small boys/girls do this business. They use these by product as fuel or sometimes as food for their cattle. For this job they don't get any food or cash amount other than the by-products (straw etc.). Some people had land by the riverside which was several miles away from their homes. In those cases contract laborers cut carry and thresh the paddy of those lands and take 10% to 12% of the total products, including straw, depending upon the distance of their lands from home.

7. Profitable Crops: Now-a-days farmers find groundnut cultivation profitable. It needs less expenditure/investment but gives good harvest/profit. They should be provided with HYV seeds as well as storage facilities.

8. Availability of seeds and pesticide: Some farmers complained that they didn't get seeds and pesticides in due time. Sometimes they have to pay higher price than the original retail price.

The Farming Systems Research Approach

To achieve its purposes this project in part introduces a farming systems approach into programs designed to strengthen agricultural research institutions and to support their activities in the field. The farming systems approach to agricultural research and the procedures for how it would function are briefly outlined here.

The Farming Systems Methodology

The agriculture of Bangladesh is complex, labor intensive and based on a relatively low technological and resource base compared to other countries of Asia. The thirty-one land use associations classified by the MOA Directorate of Soil Survey illustrate in part the complexity of farming in Bangladesh.

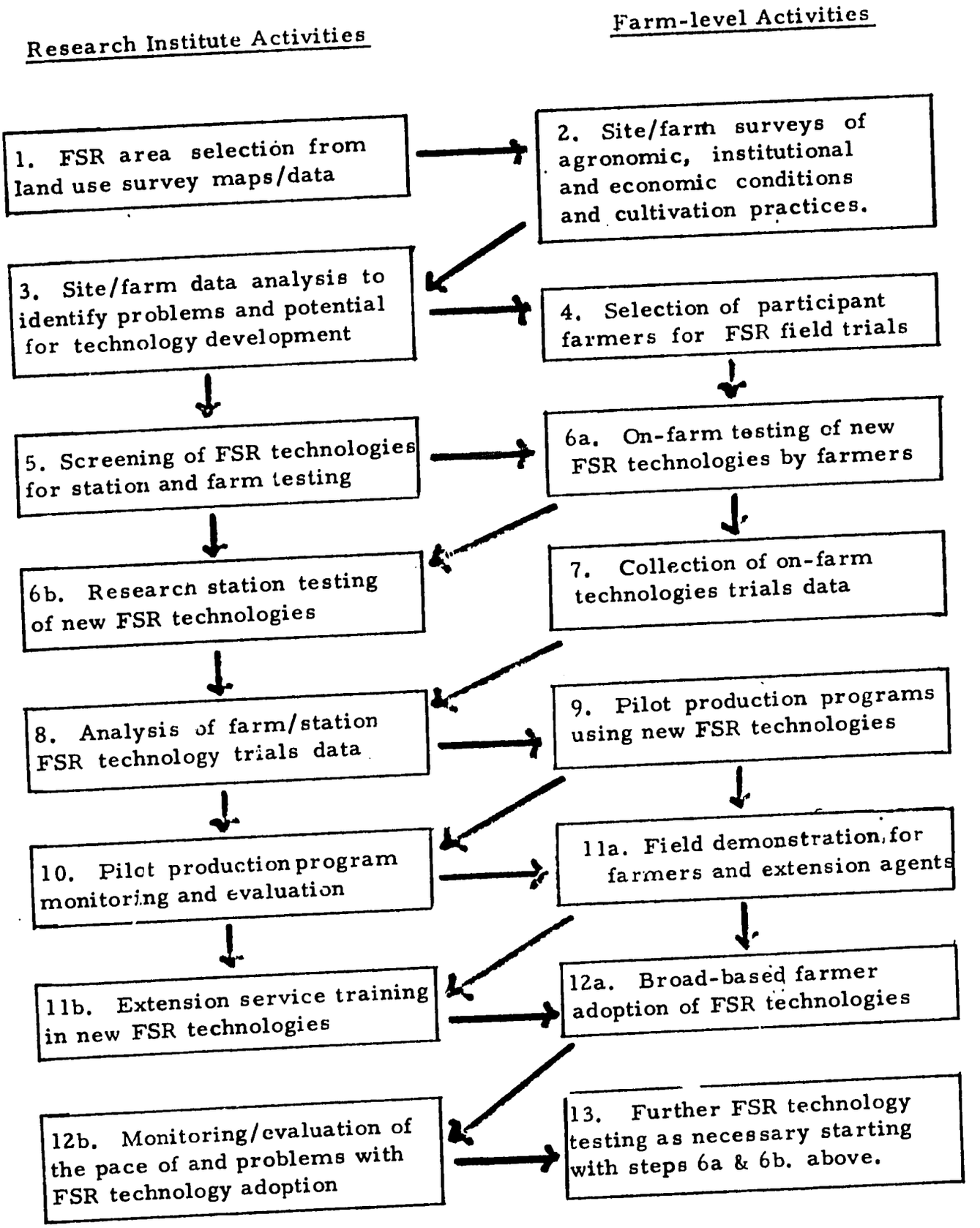
One reason why agricultural research, which has traditionally concentrated on optimizing production from a single crop or commodity, has not always been successful in Bangladesh is that the technology or variety that gave the best yields at the experiment station under controled conditions did not always fit well into existing farming systems. Recommended dates of planting and cultural practices have therefore not been followed or other components of the farmers system were found incompatible to his goals. As a consequence farmers have not been encouraged to adopt the new technology and in many cases found the existing system more to their liking.

This experience has led to the development of a farming systems approach to agricultural research in Bangladesh where the farm unit as a whole is the object of study and the farmers' field is the laboratory. This does not mean that agricultural research institutes and experiment stations will cease to function; quite the contrary, farming systems research will require much higher capacity utilization of existing research facilities than in the past. Moreover, farming systems research programs will guide the course of agricultural research activities and the allocation of agricultural research resources so as to assure these investments have a high pay-off at the farm level.

Farming Systems Research Procedures

The FSR program assisted by this project is made up of two sequential but parallel courses of action at the experiment station and farm-site levels. The make-up and relationship of these activities is represented by the flow-chart in Figure K-1.

Figure K-1: Farming Systems Research (FSR) -- Activities Flow Chart



Notable among these activities is the frequency with which farm-level agro-economic survey and analysis occurs. Early in the FSR program such surveys and analysis are conducted to identify problems which the program can address, farmers who stand to gain most from adoption of new FSR technologies, and the status of existing productive resources and institutional infrastructure available to support these technologies (See Annex H for project beneficiary selection criteria). Once appropriate FSR technologies have been screened and on-farm trials are underway, further survey and analysis will be undertaken to assess their effectiveness. Again at the pilot production stage similar analyses will be necessary to determine how well new FSR technologies "fit" with the rest of cultivators cropping systems. Finally, monitoring of the pace of and problems with FSR technology adoption among other farmers will be necessary.

The FSR program developed by this project is in no way intended to displace or disrupt on-going agricultural research institution programs. Crop-specific research activities such as varietal testing, fertilizer response performance, drought tolerance, etc. will continue and even expand. The direction of that expansion, however, will be guided by the feed back from analysis of farm-level surveys and field trials. The project, in other words, will help pull together various components of on-going agricultural research into a more farm-specific program of action.

An example of how the FSR approach would affect on-going research activities can best serve as an illustration of the project objectives. Currently, Bangladesh is testing the performance of a wide range of wheat varieties imported from Mexico, India, the United States and other parts of the world. Despite the rapid expansion of wheat acreage in Bangladesh, farmers are not getting yields anywhere near those obtained on government experiment stations.

Field-level surveys have identified late planting and low germination rates as two major contributors to low yields. These same surveys have linked these two problems to the practice of excessive tillage of the land by farmers who believe that wheat, a relatively new crop for many farmers, requires the land to be plowed as many times — often up to eight or ten plowings — as they traditionally prepared the land for rice.

However, excessive plowing both releases the moisture from the soil, which inhibits germination, and delays planting dates, which shortensthe effective growing season. Under an FAO-sponsored winter crops research program in the northwest region of Bangladesh, experiments were recently conducted on various BARI regional substations to assess the impact of minimum tillage practices on germination and yields.

Yet to be done, however, are similar trials in farmers' fields. Minimum tillage field trials -- as well as the earlier surveys and analysis to point up regions where farmers are not planting at recommended times -- will be undertaken by the FSR program, and, if better practices are found which can fit into farmers' cultivation pattern, will be introduced to farmers by the extension service and their rates of adoption monitored to assess their impact.

At the same time, of course, on-station varietal selection would continue but now with the objective of selecting varieties which perform under minimum tillage conditions and shorter growing periods as well as other desirable characteristics of disease resistance, fertilizer responsiveness etc.

In summary, concurrent station and farm trials research would be tailored to select seed varieties and cultivation practices that fit the environments in which farmers must cultivate. Explicit recognition of the entire farming system in this manner will be built into on-station research, even through in some cases a specific crop or management practice is the subject for trial and selection.

The reader is invited to follow through the fourteen steps of Figure 3 for any of the range of other technological interventions which have been identified as potential contributors to improving farmers' incomes but which still require either: a) tailoring to fit into farmers' existing systems or b) refinements in farmers' systems -- and/or institutional infrastructure for effective input delivery -- to achieve maximum impact on yields, incomes and cultivator welfare.

Farming Systems Technology Selection

An additional note on Step #5 of Figure J-1 will give the reader a clearer idea of the procedures for selecting which types of technology interventions would be most promising for station and/or farm research and development. (Attention of the reader is also called to the Annex H discussion of illustrative criteria to be used in selecting the project beneficiary recipients of these technologies).

Clearly, the facilities, talents and capacities of the existing agricultural research institutes in Bangladesh are too limited to permit tackling a whole range of technological interventions at once. Moreover, to enhance the chances of success and motivate continued, often very difficult, field-level research, it

is strategically wise to select at the outset those technologies which promise greatest impact on farmers' welfare and greatest ease in identification, testing and introduction in farmers' fields.

While agricultural research is undertaken primarily to develop better measures for increasing farmers' agricultural production, newly developed technologies have other impacts on farm production. In addition to ease of adoption, there are other factors which must be recognized in their development and promotion. Criteria to consider in selecting technologies to study, apply and evaluate include the following:

1. Impact on land and labor productivity. Technologies that offer the highest yields per unit of land and labor should be given priority; however, care must be taken to avoid expensive capital-intensive technologies in land improvements which are beyond farmers' means or which displace labor inputs.

2. Impact on utilization of idle land and labor. Technologies allowing more intensive cropping of land and use of idle labor (including women) should be given preference; technologies that address shortages of family labor during periods of peak cultivation activity (e.g. sowing, weeding, harvesting) also merit consideration.

3. Impact on costs. Technologies which have the lowest requirements for costly off-farm inputs (including hired labor) are to be prefered because of small cultivators' cash constraints. Where credit sources are available this restriction might be relaxed.

4. Impact on risks. Technologies that reduce or add least to farmers' risks of crop damage or loss should receive special preference.

5. Level of complexity. Technologies which are simple in terms of timing, rates of application, mechanical equipment and which avoid petroleum-based energy supplies are prefered over those requiring more training, more skilled management and imported inputs to make them work.

Contract Research and Sabbatical Studies

Two mechanisms, contract research and sabbatical studies, to improve linkages among research institutes and between institutes and the academic community will be promoted by the project. Contract research, which began under Phase I of the project, will be expanded during Phase II (See Table L-1). Sabbatical studies is a new initiative of Phase II.

Contract Research

The Purpose. Much of the research needed to improve farming systems and its components is both multidisciplinary and inter-institutional in nature, yet a major constraint in the research implementation relates to insufficient Governmental funding, especially the foreign currency component. Contract research provides a basis for accelerated agricultural development programs where the network Research Institutes can be tapped according to their mandates, resources and capability to seek solutions to food production, marketing and processing problems.

Contract Research refers to those studies which have been submitted by an Agricultural Research Institute/University in Bangladesh and approved by BARC for funding under AID or the World Bank projects. Contract research provides BARC the "budget clout" to direct research into priority problem areas.

The Procedure. There are two aspects to the management of Contract Research funded projects, technical and financial. The BARC exercises management control through monitoring systems exercised by the Council.

a) Technical: Substance monitoring of contract research by each Member Director, BARC of projects under his charge are carried out by appointed Technical Committee Members made up of leading multidisciplinary scientists from different institutes. At regular intervals Technical Progress is evaluated against project objectives in concert with the particular research project leader. Identified problems are discussed and resolution strategies decided upon.

b) Financial: The BARC will disburse funds to the participating Institutes whose research projects have been approved and according to a required quarterly reporting proforma agreed upon by BARC and the Donor Agency. A Budget management Control System has been developed by BARC with assistance from IADS and a local consultant.

The Output. The $500,000 provided by the project will support a basic minimum package of 10 contract research projects under BARC annually.

Sabbatical Studies

The Purpose. A gap exists between the implementing research agencies and institutes and the agricultural universities, colleges, and training schools within Bangladesh. Institutions are traditionally self-contained and guarded in their relationships with organizations that have similar areas of interests or goals. One objective of BARC is to overcome these traditional barriers. Improved communication through better working relationships is a first step. Professionals within the teaching community need to broaden their experience base and relate to agricultural research organizations. Conversely, research scientists off the campus can gain immeasurably by drawing on the skills and services of the academic community.

The Procedure. USAID under this project will provide operational funds in the amount of $250,000 over a five year period that will be utilized to support sabbaticals by professional agricultural university staff to conduct studies at participating research institutes' facilities. Sabbaticals that involve exchanges between the universities and the mono-or multi-disciplinary institutes will be of the highest priority. BARC in cooperation with the project contract representative will administer the activity. Funds will be available by USAID upon completion of an acceptable management and financial plan provided by BARC in consultation with project contractor and USAID. No sabbatical shall exceed $25,000 per year unless rescheduled by BARC and with the approval of the Project contractor.

The Output. About 10 study sabbaticals are contemplated over the life of the project.

Table L-1 : BARC Contract Research Funded by USAID through October, 1980

Division/Project Title	Institution	Local	F.Exchange	Total
		(All Figures in Taka)		
A. Soil and Irrigation				
1. Soil Test Crop Response Correlation Studies For Rice	BAU	1,35,840	-	1,35,840
2. Soil Test Crop Response Correlation for Wheat, Cotton, Tobacco, Potato and Pulses	BARI	3,63,000	1,01,000	4,64,000
3. Study of Soil and Water Management Practices for Crop Production	BARI	2,70,100	4,46,000	7,16,100
B. Ag. Engineering				
1. Improvement and Design of Manually Operated Corn Sheller Presently Available in the Country	BARI	16,500	-	16,500
2. Development of Small Scale Storage Facilities for Cereals and Tubers	BAU	54,600	-	54,600
3. Collection of Different Types of Manually Operated Irrigation Pumps Available in the Country and Evaluation of their Performance	BRRI	30,000	-	30,000
C. Social Sciences & Ag. Economics				
1. Benchmark Survey and Socio-Economic Study of National Coordinated Cropping Systems Program at Jessore and Chittagong	BARI	2,10,000	1,40,000	3,50,000

	Institution	Local	F.Exchange	Total
D. Crops and Forestry				
1. A Coordinated Scheme for the Improvement of Black-gram and Kheshari	BARI	4,50,916	-	4,50,916
2. Development of Root Crops of Bangladesh with Particular Emphasis on Sweet Potatoes and Aroids	BARI, BAU	3,55,280	-	3,55,280
3. Study on the Biology and Control of Mango Shoot Gall		60,212	-	60,212
4. Variety Development in Maize	BARI	1,12,332	-	1,12,332
5. Collection and Evaluation of Cheena and Kaon	BARI	97,100	-	97,100
6. Coordinated Pulse Project	BARC BVRDC BARI	4,49,689	-	4,49,689
				32,92,569

PROJECT AUTHORIZATION

BANGLADESH

Agricultural Research II
Project No. 338-0051

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended (the "Act"), I hereby authorize the Agricultural Research II Project (the "Project") for the Government of Bangladesh (the "Cooperating Country") involving planned obligations of not to exceed Seventeen Million Five Hundred Thousand United States Dollars ($17,500,000) in Grant funds over a five year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to assist in financing foreign exchange and local currency costs for the Project.

2. The Project will assist in improving the capability of agricultural research institutions in the Cooperating Country in order to improve the farming systems of small cultivators of food crops in the Cooperating Country by providing technical assistance, training, minor construction/improvements, and commodities for research systems management, on-farm trials of farming systems, library and communication services and for crop and livestock research, economic and social sciences, water and soil management and pest control.

3. The Project Agreement which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

4. a. Source and Origin of Goods and Services.

Goods and services, except for ocean shipping, financed by A.I.D. under the Project shall have their source and origin in the Cooperating Country or in countries included in A.I.D. Geographic Code 941, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the Project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the Cooperating Country or the United States.

b. Conditions Precedent to Disbursement.

Prior to any disbursement under the Grant or the issuance by A.I.D. of any documentation under the Project Agreement pursuant to which disbursement will be made, the Cooperating Country shall, except as A.I.D. may otherwise agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D., evidence of the designation of the Executive Vice Chairman of the Bangladesh Agricultural

Research Council ("BARC") as representative of the Cooperating Country for the Project authorized to manage the Project on behalf of the Cooperating Country.

c. Covenants.

(1) The Cooperating Country shall agree that the procurement or use of pesticides financed by A.I.D. under the Project shall comply with the A.I.D.'s environmental procedures regarding the procurement or use of pesticides.

5. Waivers.

Based upon the justification set forth in Annex R of the Project Paper, I hereby

(a) approve a source waiver from A.I.D. Geographic Code 000 (U.S. only) to Geographic Code 935 in the amount of approximately $48,000 for the procurement of 40 110cc motorcycles required for the Project;

(b) find that special circumstances exist to waive and do hereby waive the requirements of Section 636(i) of the Act;

(c) certify that the exclusion of the procurement of such motorcycles from the source described above will seriously impede accomplishment of foreign policy objectives and the objectives of the foreign assistance program.

Clearances:	Date	Initial
Frederick W. Schieck, A/AA/Asia	_____	_____
Kelly C. Kammerer, A/GC	_____	_____
Alexander Shakow, AA/PPC	_____	_____

Signature_____
Acting Administrator

_____
Date

GC/Asia:SRTisa:hp:1/23/81

Clearances on Yellow:

GC/Asia:HEMorris_____
Asia/PD:GRVan Raalte_____
Asia/DP:RHalligan_____
Asia/BI:NTumavick_____

Job Descriptions for Technical Advisors

I. Research Systems Management

1. Research Management Advisor

The Chief of Party (COP) would occupy this position. He will be housed at BARC. In addition to the role of team leader the research management post requires broad experience and competence in research management. Duties would include assisting participating institutes' senior administrative directors in the use of total physical and human agricultural research resources through better program planning, implementation, and evaluation. Research management also includes developing links between scientists and extension personnel, strengthening relationships with international centers and donor agencies, and improving the communication and training competence of the research system network. The Research Management Specialist will also advise and counsel on effective budget control and financial management.

2. Training Specialist

The Training Specialist will work primarily at BARC in assisting to develop a competent training unit. He will assist in developing and implementing a master plan in training/communication to improve transfer of technology among scientists, extension personnel and farmers. The position will demand knowledge of training within the country and abroad, short-term and long-term. In assisting development of the overseas training program the specialist will need a broad knowledge of curriculum and methods of instruction used by a variety of institutions, universities and international centers in order to tailor training programs to the needs of the participants. Competence in multimedia communication systems is desirable.

3. Administration Specialist

The administration specialist will work at BARC with major responsibility to provide all forms of logistic support to expatriate consultant/specialists including housing, travel, relationship with local government, etc. The specialist would assist/develop the International Project Support Office of BARC to strengthen links with donor agencies, and advise and assist BARC in the control of management of donor funds to the research net work. In addition the specialist would provide advice and assistance in the overall administrative support services provided by BARC to the national research net-work including budget development and management, procurement and personnel services.

4. Associate Station Management Specialist: (Regional and Substations)

These specialists will be based at appropriate stations of BARI and BRRI to assist the officers in charge with farm management and the field experiment operations. A major responsibility will be to assist and advise in the on-farm testing programs aimed at both validating improved technology and guiding experiment station research to solve priority on-farm problems.

5. Maintenance Specialist:

This specialist will assist the establishment of efficient repair and maintenance facilities at the Central BARI Experiment Station for farm tractors and machinery, electrical installations, motor vehicles, instruments and buildings. The organization of efficient and rapid procurement procedures, stores and training of personnel for the maintenance workshops will also be necessary.

6. Land Development Specialist:

The specialist will assist in the improvement of the Central, Regional and Substations of LARI, continuing the work of Phase I on land shaping, drainage, installation of irrigation using both contractors and the staffs of the experiment stations. The specialist will also help organize the training of engineers on land development and assist in procurement.

II. Farming Systems Research

1. Farming Systems Specialist:

The position of Farming Systems Specialist will work from BARC to strengthen the on-farm testing network and back up component research at the respective participating institutes' experiment stations. A sound knowledge of both agronomy and production economics with experience in livestock and/or fisheries would be desirable. The specialist will work primarily with teams of multidisciplinary and inter-institutional scientists and assist develop the country and overseas training programs and encourage research/extension interventions in collaboration with farmers and scientists.

III. Economic and Social Science:

1. Agricultural Economist:

The agricultural economist will provide assistance and direction to the development and upgrading of a national network of social scientists who are expected to work closely with biological scientists in attempting to solve socio-economic constraints to increased production. The specialist will work with BARC and will work closely with the social science (mainly agricultural economics) staff of agricultural research institutions which presently employ social scientists as well as working towards the introduction at agricultural research institutions which do not yet employ the services of the social scientists. While the major emphasis will be agricultural economics, the disciplines of sociology and anthropoligy are expected to be introduced into the agricultural research system. A primary responsibility will be to develop, manage, and monitor the social science component for all nationally coordinated agricultural research programs.

2. Agricultural Economist

The economist will advise and assist in the development of competency in carrying out research to effectively support the direction and use of improved agro-technology for which the participating institutes are responsible. The duties will be in research program development (setting of priorities), staff development and training, and providing advice and direction to on-going farm-based research. The agricultural economist will develop and encourage the use of socio-economic criteria in the design and selection of research activities at the various institutes' experiment stations and for on-farm research in connection with food crops and farming systems.

IV. Information and Library Services:

1. Information Specialist:

This specialist will assist with the development of an overall development program for information and library services at the central and regional experiment stations of the participating institutes. The responsibilities include planning for the orderly expansion of scientific libraries and documentation services, the development and design of programs to provide printed information for the various groups in the agricultural research and production systems. The person will also have responsibility for designing and implementing staff development programs in the areas of library services and information delivery systems.

V. Crops Research:

1. Agronomist:

The research agronomist will work with BARC and participating institutes' scientists, (mainly within their Agronomy Divisions) to help develop, organize and implement multidisciplinary research programs on rice and non-rice food crops. The agronomist will concentrate on individual crop technology rather than cropping systems. Wheat, pulses and root crops are major areas of concern. Development of breeding and seed production programs, to help improve research methods, field experiment organization

and the reporting and publication of results will be other areas of responsibility. The agronomist will assist in determining training needs, the selection of individuals for training and the procurement of supplies, equipment in the agronomy areas.

2. Coarse Grain Specialist:

The specialist will assist concerned BARI Scientists with improving varieties and cultural practices for maize, barley, millets and sorghum and in improved seed production working both on the research stations of BARI and on farmers fields. The specialist will also assist BARC to coordinate national programs on these crops and to some extent BADC with seed production. The specialist should have a strong background in plant breeding with a good grounding in agronomy.

3. Horticultural (Veg.) Specialist:

The horticultural specialist will work mainly with concerned BARI Scientists within its Horticultural Division, with BARC, BADC and with the Horticultural Development Board to improve research on both local and exotic vegetable production, especially in the summer season. The specialist will concentrate on development of intensive vegetable production systems on a year-round basis, particularly in respect to more intensive use of the homested plots and family labor. The specialist will also help develop specifications for quality grading and cooperate with economists in marketing research and development.

VI. Livestock Research

1. Livestock Specialist:

The Livestock Specialist though located at BARC would work closely with the Livestock Directorate to assist/initiate a unified research commitment to acquire data on livestock feed, health, husbandry and production. In addition the specialist would advise in the development of an improved livestock technology component in farming systems. Investigatory studies would emphasize quantification of nutritional values of major feeds/residues and draft power problems.

VII. Soil Management:

1. Soil Fertility Specialist:

He will work with concerned scientists mainly at BARI within the Soils and the Field Trials Divisions but also with BARC and other Institutes to help develop, organize and implement field research on soild fertility problems especially on the major nutrients including sulphur and micronutrients such as zinc and copper. The specialist should develop and implement programs on nutrient cycles in different cropping systems, nutrient leaching, the value of fertilizer residues, and crop response/soil analysis relationships for different crops that relate to published reconnaisance soil survey information. The specialist should help with formulation and publishing fertilizer recommendations for all crops on bench mark soils,determine training needs and assist with the procurement of supplies and equipment.

2. Soil and Plant Analyst:

The analyst will assist participating institutes' scientists to organize, equip and run several analytical laboratories at their central and regional stations. The specialist will help set up sample recording procedures, sample preparation facilities and standardized methods of analysis. He will train technicians and advise on training needs and procurement of equipment and repairs.

VIII. Water Management

1. On-Farm Water Management Specialist

The On-Farm Water Management Specialist will work on identification and testing of effective water distribution and scheduling systems; work closely with social scientists on water distribution problems; assist in identification of means to increase the efficiency of energy utilization in respect to fossil fuels, animal and human powered systems; and work with various institutions providing training and extension services aimed at improving water management. The specialist must be able to work with small systems, most under 100 acres,within the context of a complex small holder land tenure situation.

IX. Pest Management:

1. Wildlife Biologist - 1

This position will be filled with a biologist trained and experienced in Asian vertebrate pest damage control. The biologist will be responsible, along with Bangladeshi counterparts, to continue to develop research capabilities in the field of vertebrate pest management within BARI and the other participating institutes, notably, BRRI and SRI. Ongoing research activities such as the development of field rat damage assessments, rodent control field trials, and laboratory bioassay tests of the many candidate rodenticides will be continued. The biologist will assist in organizing and implementing large-scale field rodent control programs and monitor the effectiveness and economics of rodent control using different techniques. The biologist will assist in transmitting pertinent research findings to field stations, government agencies, and international organizations. Assistance with the development of training materials and systems to instruct government personnel and farmers in the use of safe and economically sound methods of vertebrate pest control will also be given.

2. Wildlife Biologist - 2

A biologist trained and experienced in Asian animal damage will be recruited for this position. The biologist will concentrate his efforts on bird damage control in sprouting and mature wheat, sprouting rice, mature sorghum, corn, millets, and pulses. The biologist and Bangladeshi counterparts will be primarily responsible for testing latest technologies in bird damage control, while also examining for locally economically feasible techniques for control -- such as: the use of plant biproducts high in tanins when applied to seeds or grains to serve as bird repellants. Laboratory and field experiments will be completed at participating institutes' stations and in farmers' fields and the research findings transmitted to government personnel and farmers through training programs and seminars. The biologist will also assist with rodent, jackal and other vertebrate pest research where required.

3. Plant Pathologist:

The pathologist will work with participating institutes' scientists in their Plant Pathology Division and in other programs to help develop

disease monitoring and control research programs including the setting up of laboratory backup facilities to deal with seed-borne fungi and viruses on cereals, pulses and oilseeds, and the use of seed dressings.

4. Entomologist:

The entomologist will work with participating institutes' scientists in their Entomology and other Divisions to help develop insect pest monitoring and control research programs. The entomologist will work closely with other scientists, particularly breeders, in developing insect resistant varieties and in identification of biological control options. The specialist will help with equipment procurement from project funds, identification of trainees and training of technicians.

PROJECT COST COMPUTATIONS

Long-term Senior, Intermediate and Associate Resident Specialists

(Per Person Year)

	Specialists Senior	Intermediate	Associate Specialists
A. Salary, Benefits, Allowances	$ 60,000	$ 38,000	$ 13,000
Base Salary	35,000	20,000	12,000
Post Differential	8,000	5,000	-
Employee Benefits	10,000	6,000	1,000
Education (2 children average)	6,000	6,000	-
Storage of Household Effects	1,000	1,000	-
B. Relocation and Travel	20,500	20,500	6,000
Pre-employment travel 1/	600	600	-
To post travel or home leave	10,000	10,000	2,400
R & R Travel	2,000	2,000	-
Vehicle shipment 2/	800	800	-
Household/Personal Effects 3/	3,600	3,600	1,800
Professional conference/Int., Travel	3,000	3,000	1,800
In-country travel	500	500	-
C. Support	16,000	16,000	8,300
Rent	10,000	10,000	5,000
Utilities	4,000	4,000	2,000
Professional supplies/services	2,000	2,000	1,300
D. Overhead (25% for Sr./Intr; 10% for Assoc.Specialists)	24,000	19,000	2,700
E. Total	$ 120,500	$ 94,000	$ 30,000

1/ $ 3,000 + 5 years

2/ $ 2,000 x 2 + 5 years

3/ $ 9,000 x 2 + 5 years for Senior and Intermediate

$ 4,500 x 2 + 5 years for associate

PARTICIPANT TRAINING COST CALCULATIONS

(In-Country Training - Workshops, Conferences, Seminars)

Category of Training	Per Year				Total five years			
	Number of Workshops	Participants per workshop	Days per workshop	Cost per workshop	Number of workshops	Number of participants	Participant days	Total cost
Research Systems Management	5	30	3	$ 1500	25	750	2250	$ 39,000
Farming Systems	20	20	5	$ 1200	100	2000	10000	120,000
Economic/Social Sciences	3	20	5	$ 1500	15	300	1500	23,000
Information/Library	2	25	3	$ 1500	10	250	750	15,000
Crops Research	3	20	5	$ 1500	15	300	1500	23,000
Livestock Research	3	20	5	$ 1500	15	300	1500	23,000
Soil Management	2	20	5	$ 1500	10	200	1000	15,000
Water Management	2	20	5	$ 2000	10	200	1000	20,000
Pest Control Research	3	20	5	$ 1500	15	300	1500	22,000
Total	43	175	36	-	215	4,600	21,000	$ 300,000

(U.S. and 3rd Country Training - 1981 Costs)

Academic U.S.	$ 1,850/mo (or $22,200/yr)
Academid 3rd country	$ 1,000/mo (or $12,000/yr)
Non-academic 3rd country	$ 1,500/mo (or $18,000/year)

Commodities Budget ($ 000)

(Summary)

	Category	Amount ($000)
1.	Research System Management	$ 225
2.	Farming System	300
3.	Economics	211
4.	Information/Library Service	290
5.	Crop Research	360
6.	Livestock Research	50
7.	Soil/Management	300
8.	Water Management	300
9.	Pest Research	87
	Total	$2,123

(Research Management)

1.	Contractor Household Equipment	$ 112
	Refrigerators, gas cookers air conditioners, washing machines, water heaters, ceiling fans, transformers, lawnmowers and spare parts.	
2.	Contractor Household Furniture	$ 73
	Dining, bedroom, living room and cane furniture sets, carpets, draperies, upholstery.	
3.	Contractor Office Equipment	$ 40
	Typewriters (manual and electric), copier, memio machine, table calculator, ceiling fans, air conditioners, filing cabinets, desk fans, table lamps, tape recorder, transformer, almirahs.	
	Total	$ 225

Category	Amount ($000)
(Farming Systems Research)	
1. Commodities and Services for 10 additional Regional Sites including:	$ 300
Field equipment (balances, tapes, bags, frames, threshers, hand implements etc.); labor, maintenance, transport services, printing materials, publications; seed, seed fertilizer, pesticides; spares, accessories; office equipment and furniture.	
(Economic and Social Sciences)	
1. Data Processing Equipment and Services	$ 115
Desk-top computers with peripheral equipment, programmable scientific calculators with peripheral equipment, spare parts, maintenance services, data processing and programming services.	
2. Data Collecting Equipment	$ 16
Four-function calculators, tapes, portable threshers, moisture meters, scales.	
3. Office Supplies/Equipment	$ 80
Typewriters, supplies, filing cabinets, office equipment, office furniture, publication and printing services.	
Total	$ 211
(Information and Library Services)	
1. Books/Periodicals	$ 150
General/specific reference, special texts, journals, abstracts, reports, technical publications	
2. Library Audio/Visual Aids	$ 10
Overhead projector, accessories, slides, screen, related supplies, video aids (as appropriate)	

Category	Amount ($000)
(Information and Library Services) (continued)	
3. Library Equipment/Supplies	$ 40
Cabinets, shelves, book, trolleys, card catelogue cabinets, book storage, display systems	
4. Library Support	$ 30
Typewriters, supplies, copier, duplicator, accessories, calculators, reader service supplies, selected operational supplies	
5. Information and Communications	$ 60
Projectors, screens, accessories, cassettes, recorders, tapes and accessories, cameras, related photography and darkroom equipment, instructional demonstration materials, outreach kits, with audio visual aids, teaching and demonstration supplies.	
Total	$ 290
(Crop Research)	
1. Glasshouses	$ 115
25' x 41' (2) 12' x 21' (4)	
2. Nethouses	$ 30
25' x 41' (2)	
3. Glass/Net House Services	$ 15
Power, water, supplies, deionisers, benching	
4. Laboratory Equipment for agronmy, microbiology, plant breeding, horticulture, including:	$ 150
large ovens, sterile cabinets, instruments; chemicals, glassware; seed-test equipment.	
5. Spares and repairs for all Phase I and Phase II laboratory equipment	$ 50
Total	$ 360

Category	Amount ($000)
(Soil Management)	
1. Soils Laboratory and Field Equipment	$ 25
Soil core samplers, accessories, drying ovens, spectrophotometer, centrifuge (general purpose), soil sieves, mills, soil conductivity meter accessories, supplies e.g. chemicals, glassware	
2. Small Farm Machinery Research	
Workshop equipment (tools shaper, milling, pipe bending, foundry	$ 58
Drawing office and soil mechanics	$ 12
Purchase of prototypes from local and foreign sources, including: animal-drawn implements pedal threshers, shellers, solar pumps and driers plus accessories.	$ 30
3. Farm Machinery for Experiment Stations	$ 125
40-45 HP Tractors (4), ploughs, harrows drills, weeders, land levellers (2), crop driers.	
4. Spares	$ 50
Total	$ 300
(Water Management)	
1. Field Equipment	$ 50
Water samplers, flumes, tensilometers, conductivity meters, levels, plane, tables	
2. Irrigation Equipment	$ 175
Ditcher, pumps, pipe, valves, engines	
3. Office Equipment	$ 25
Drawing boards, technical manuals, supplies	
4. Workshop Equipment	$ 50
Total	$ 300

Category	Amount ($000)
(Pest Management)	
1. Laboratory Equipment (Entomology/Pathology)	$ 15
Microscopes, slide projector, balances, microtome, microslide cabinet, oven, camera (35 mm), refrigerator, incubator	
2. Field Studies (Entomology/Pathology)	$ 2
Sprayers, light traps, nets, black lights	
3. Laboratory Equipment (Vertebrate)	$ 33
Glassware, pellet machine, scales, analytical balance, chemicals, camera, projector (16 mm), telemetry equipment, calculators (2)	
4. Field Studies (Vertebrate)	$ 37
Traps, nets, cages, mixers, outdoor motor (20 hr), audio-visual aids, loudspeaker, generator, rodenticides, storage cabinets, scales	
Total	$ 87

Vehicles (1980 Constant $ US)

Description	CIF Unit Price - US$
Sedan (gas, 1200 cc)	5,000
Jeeps (diesel, hard top)	9,000
Minibus (diesel, 15-seater)	8,500
Pick-up (diesel, 2.0 Ton-cap.)	8,500
Truck (diesel, 3 Tons)	12,000
Motorcycles (110 cc)	500
Bicycles (locally made)	140
Motor Scooter (Indian)	1,000

Initial Environmental Examination

Project Location :	Bangladesh
Project Title :	Agricultural Research II #388-0051
Life of Project :	5 years
IEE Prepared by :	Allen C. Hankins, (ASIA/TR AID) Murray Dawson (IADS)
Date :	10 November, 1980
Recommended Action:	Negative Determination
Concurrence :	

I have reviewed the Initial Environmental Examination for the Bangladesh Agricultural Research II Project and concur in the Threshold Decision recommendation for a Negative Determination for all project activities except pesticides use.

Frank B. Kimball
Mission Director
November 26, 1980

AA/ASIA Decision:

Based upon the review of the Project Paper, including the Initial Environmental Examination, I approve the Threshold Decision for a Negative Determination for all project activities except pesticides use.

Frederick W. Schieck
Acting Assistant Administrator for Asia

Date:

Initial Environmental Examination

1. Project Description

The purpose of the project is to expand and strengthen the agricultural research system in Bangladesh so that improved agro-technology may be developed, tested and utilized by farmers with the primary purpose of substantially increasing food productivity. Increased activities in research are expected to provide a more adequate supply of trained people and information with which agriculture may develop in the country. These activities are in collaboration with the Government of Bangladesh and with full recognition of the social and economic systems and ecological constraints of the region.

Project funds will be used to provide technical assistance, training and commodities to support designated agricultural research activities which will strengthen the Bangladesh Agricultural Research Council role.

2. Identification and Evaluation of Environmental Impacts

A. Land Use

1) Changing the Character of the Land through:

a) Increasing Population: None.

b) Extracting Natural Resources: The field agricultural activities will change the soil fertility. However, these soil nutrients will be replaced periodically with the expectation that the soil quality will actually improve over the course of the life of the project.

c) Land Clearing: Only a very limited amount of land clearing will take place in this project, most of which will be on experimental fields of the research stations or in the cultivated fields of demonstration farmers. Most of the vegetation will be in the form of weeds or soft brush, which has no special or unique ecological or economic value.

d) Changing the Character of the Soil: No physical changes to the soil are contemplated except the routine removal of debris, minor land levelling in established fields, or ditching for on-farm irrigation. On the contrary, improved farming systems with sustained production will increase soil productivity.

2) Altering Natural Defense of the Area

With little exception, all existing trees will be left in their natural state. Only temporary and minimal soil erosion problems are likely to emerge. Since this is an agricultural research project, the farm management practices applied on the production sites will follow the basic principles of reducing soil erosion and assuring that land problems principally related to surface water flow will be addressed appropriately.

3) Foreclosing Important Uses

The lands at the experiment stations and those used for on-farm studies are for the purpose of testing new agro technology which can be ultimately used by the farmers of Bangladesh.

4) Jeopardizing Man and His Works

Any construction, land development or rehabilitation will be done according to acceptable practices in Bangladesh and on existing agricultural research stations.

B. Water Quality

1) Changing the Physical State of the Water

There will be drainage problems during the monsoon season. Unavoidable water logging results, but this is in the nature of things for Bangladesh. Regular maintenance practices on the experimental fields will be applied to reduce this problem to enable necessary agricultural research to take place.

2) Changing the Chemical and Biological State

Chemical fertilizers, herbicides and pesticides to be used in this project do have a potential for creating adverse effects on the environment. However, all chemicals used for research purposes by or under the close supervision of project personnel should not create any adverse effects. Only pesticides used in farmer's field trials have a potential for creating adverse environmental impacts, due to farmer's unfamiliarity with these chemicals, and should receive further environmental analysis.

2) Changing the Ecological Balance of a Water Body

None.

C. Atmospheric

No environmental Impact.

D. Natural Resources

1. Diversion, Altered Use of Water

Increased water consumption will be within the existing capacity of the research facilities and not require amy modification to existing water supply.

2. Irreversible, Inefficient Commitments

No irreversible or inefficient commitments will result from this project.

E. Cultural

No environmental impact

F. Socio-Economic

1. Changes in Economic/ Employment Patterns
This project could enhance employment opportunities through the generation of increased food production, particularly in the rural areas.

2. Changes in Population

This project will not play an active role in changing the population of the country.

3. Changes in Cultural Patterns

This project of itself will have no effect on changes in cultural patterns. Its activities will promote the retention of traditional rural practices and the use of traditional foods.

G. Health

1. Changing a Natural Environment

This project should not affect any natural disease control vectors. It may prompte the increased use of non-chemical means of pest and weed control.

2. Eliminating an Ecosystem Element

No element of any health related ecosystem is involved in this project.

3. Safety Provisions

All necessary recommended safety precautions will be applied in classroom, laboratory and field education programs.

H. General

1. International Impacts

Project privides technology, training opportunities and commodities

from sources outside the region that are socially and economically acceptable and which will contribute to overall well-being of the region's agricultural programs.

2. Controversial Impacts

This project is in line with the commitment of the Government of Bangladesh to develop the appropriate capacity and effectiveness of agricultural research which can be utilized by Bangladesh farmers.

3. Larger Program Impacts

This project will have a positive impact on the future agricultural development programs of Bangladesh.

III. Recommendation for Environmental Action

On the basis of the information supplied herein, it is indicated that all project activities, except possibly the use of pesticides, will not have a significant adverse effect on the environment. Further environmental analysis of pesticides use is not required under AID Environmental Regulations when they are to be used in "controlled experimentation exclusively for the purpose of research which is confined to small areas and carefully monitored." However, since the project will also support the use of pesticides in farmers fields and the dissemination of information on pesticides use the Mission recommends that further environmental analysis on pesticides use be conducted for pesticides to be used only in field trials.

3. IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-areas	Impact Identification and Evaluation 1/
A. LAND USE	
1) Changing the character of the land through:	
a. Increasing the population	N
b. Extracting natural resources	L
c. Land Clearing	L
d. Changing soil character	L
2) Altering natural defenses	M
3) Foreclosing important uses	N
4) Jeopardizing man or his works	N
5) Other factors	
_____	N
_____	_____
B. WATER QUALITY	
1) Physical state of water	L
2) Chemical and biological states	L
3) Ecological balance	N
_____	_____

1/ Symbols:
N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

C. ATMOSPHERIC

1) Air additive ---------- N
2) Air pollution ---------- N
3) Noise pollution ---------- N

D. NATURAL RESOURCES

1) Diversion, altered use of water ---------- L
2) Irreversible, inefficient commitments ---------- N

E. CULTURAL

1) Altering physical symbols ---------- N
2) Dilution of cultural traditions ---------- N

F. SOCIO-ECONOMIC

1) Changes in economic/employment patterns ---------- M
2) Changes in population ---------- N
3) Changes in cultural patterns ---------- M

G. HEALTH

1) Changing a natural environment ---------- N
2) Eliminating an ecosystem element ---------- N
3) Other factors
Safety Provisions ---------- L

H. GENERAL

1) International impacts ---------- L
2) Controversial impacts ---------- N
3) Larger program impacts ---------- M

From : Muhammed Ali,
Joint Secretary.

#739

Ministry of ~~Economic~~ Finance
External Resources Division
Government of the People's Republic of Bangladesh
Sher-E-Bangla Nagar
Dacca-15

D.O.No. ERD/USA(P)-39/80

December 4, 1980

Subject: Agricultural Research Phase-II Project

INFO	
DIR	✓
D/DIR	✓
PRO	✓
RDE	
ENG	
F/AGR	
PHAW	
TRG	
CONT	✓
CLB	
EXO	
PER	
TVL	
RLA	
GSO	
REPLY/NAN Int'l	
Date	
Initial	

Dear Mr. Kimball,

Please refer to the USAID Project Paper entitled Agricultural Research Phase -II which describes the subject project jointly developed by experts from the Bangladesh Agricultural Research Council(BARC) and the USAID based on the recommendations presented in the Research Review Team Report of July 1980. The proposed project is intended to be used by the BARC to guide and support the agricultural research activities of the participating agencies (BARI,BRRI,BAU etc.) in developing component technologies designed to improve the farming systems of the country's small cultivators of food and fibre crops.

In view of the importance of the project, the Government requests USAID to provide the required grant of approximately US dollars 17.5 million and initiate implementation as soon as possible.

With regards,

Yours sincerely,

4/12/80

(Muhammed Ali)

Mr. Frank B. Kimball,
Director,
USAID Mission to Bangladesh
Jiban Bima Bhaban(4th floor),
Motijheel C/A.,
Dacca.

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WAIVER OF SOURCE/ORIGIN AND SECTION 636(i) REQUIREMENTS

Problem: A waiver of Section 636(i) requirements of the Foreign Assistance Act of 1961, as amended, and a waiver of source/origin requirements are requested to allow for the purchase of 40 motorcycles for use under the Bangladesh Agricultural Research Project (388-0051).

Cooperating Country:	Bangladesh
Project:	Agricultural Research II
Nature of Funding:	Grant
Description of Goods:	40 110 cc Motorcycles
Approximate Value:	$1200 each
Source/Origin:	Bangladesh/Japan

Discussion: Under Phase II of the Agricultural Research Project, the Bangladesh Agricultural Research Council will contract with an expatriate consultant firm to upgrade the technical capabilities of the personnel involved with the Agricultural Research Program and to improve the system's outreach to small farmers. To ensure adequate linkages between the research stations and farmers, suitable transportation must be provided to researchers who will be required to travel extensively in remote areas of Bangladesh where roads are primitive at best. A motorcycle with an approximately 100 cc engine (8 horsepower, 200 pounds) is most suitable in regard to local conditions. Larger motorcycles are too heavy for the average local driver and are not designed to negotiate the rugged roads of Bangladesh.

No American manufacturer produces a motorcycle under 350 cc. In addition, adequate maintenance and repair facilities and spare parts are not available in Bangladesh for American manufactured motorcycles. Adequate maintenance facilities for motorcycles manufactured in other Code 941 countries are also not available. The Mission, therefore, anticipates purchasing locally assembled motorcycles of Japanese origin. To purchase these motorcycles, a waiver of Section 636(i) requirements and a waiver of source/origin requirements are necessary.

By approving this waiver you are certifying that exclusion of procurement from Free World countries other than the cooperating country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives.

Recommendation: That you waive the restrictions of Section 636(i) of the Foreign Assistance Act, as amended, and waive the source/origin requirements proposed in the Project Authorization.

COUNTRY CHECKLIST

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. 116. Can it be demonstrated that contemplated assistance will directly benefit the needy ? If not, has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights ?	It can be demonstrated
2. FAA Sec. 481. Has it been determined that the government of recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the United States unlawfully?	No
3. FAA Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the International Communist movement?	Yes
4. FAA Sec. 620(c). If assistance is to government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government?	No
5. FAA Sec. 620(e) (1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing owner-	No

ship or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

6. FAA Sec.620(a), 620(f), 620D; FY 79 APP. Act. Sec. 108, 114 and 606. Is recipient country a Communist country? Will assistance be provided to the Socialist Republic of Vietnam, Cambodia, Laos, Cuba, or Angola? Will assistance be provided to Afghanistan or Mozambique without a waiver?

a. No
b. No
c. No

7. FAA Sec.620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States (b) the planning of such subversion or aggression?

No

8. FAA Sec.620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property?

No

9. FAA Sec. 620 (l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, inconvertibility or confiscation, has the AID administrator within the past year considered denying assistance to such government for this reason?

OPIC bilateral agreement was signed January 15, 1975.

10. FAA Sec.620(o); Fishermen's Protective Act of 1967, as amended, Sec.5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters:

N/A

a. has any deduction required by the Fishermen's Protective Act been made?

b. has complete denial of assistance been considered by AID Administrator?

11. FAA Sec. 620; FY 79 App. Act, Sec. 603

(a) Is the government of the recipient country in default for more than 6 months on interest or principal of any AID loan to the country? — a) No

(b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds? — b) No

12. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget which is for military expenditures, the amount of foreign exchange spent on military equipment and the amount spent for the purchase of sophisticated weapons systems? (An affirmative answer may refer to the record of the annual "Taking Into Consideration" memo: "Yes, as reported in annual report on implementation of Sec. 620(s)." This report is prepared at time of approval by the Administrator of the Operational Year Budget and can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.) — N/A

13. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption? — No

14. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? — Not in arrears

15. FAA Sec. 620A, FY 79 App. Act, Sec. 607. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism? — No

16. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. there to carry out economic development program under FAA? — No

17. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it detonated a nuclear device after August 3, 1977, although not a "nuclear-weapon State" under the nonproliferation treaty? — No

B. FUNDING CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria

a. FAA Sec. 102(b) (4). Have criteria been established and taken into account to assess commitment progress of country in effectively involving the poor in development, on such indexes as : (1) increase in agricultural productivity through small-farm lavor intensive agriculture, (2) reduced infant mortality, (3) control of population growth, (4) equality of income distribution, (5) reduction of unemployment, and (6) increased literacy? — Yes

b. FAA Sec. 104(d) (1); IDC Act of 1979. If appropriate, is this development (including Sahel) activity designed to build motivation for smaller families through modification of economic and social conditions supportive of the desire for large families in programs such as education in and out of school, nutrition, disease control, maternal and child health services, agricultural production, rural development, assistance to urban poor, and through community-based development programs which give recognition to people motivated to limit the size of their families? — Yes

PROJECT CHECKLIST

A. GENERAL CRITERIA FOR PROJECT

1. FY 79 App. Act Unnumbered; FAA Sec. 653 (b); Sec. 634A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $ 1 million over that figure)?	(a) Project was included in FY 81 Congressional Presentation Annex II, Asia Programs, p. 25. Congressional Notification will be prepared to explain increased cost. (b) Yes
2. FAA Sec. 611 (a) (1). Prior to obligation in excess of $ 100,000, will there be (a) engineering, financial, and other plants necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?	(a) Yes (b) Yes
3. FAA Sec. 611 (a) (2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	None required
4. FAA Sec. 611(b); FY 79 App. Act Sec. 101. If for water or water-related land resources construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?	N/A
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $ 1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	Yes

6. FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	No
7. FAA Sec. 601 (a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	(a) No (b) No (c) No (d) N/A (e) Yes (f) No
8. FAA Sec. 601 (b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	N/A
9. FAA Sec. 612(b); Sec. 636 (h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.	(a) N/A (b) N/A
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	No
11. FAA Sec. 601 (e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes
12. FY 79 App. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world	N/A

markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar, or competing commodity?	N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); 111; 113; 281a. Extent to which activity will (i)effectively involve the poor in development, by extending access to economy at local, level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (ii) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (iii) support the self-help efforts of developing countries; (iv) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (v) utilize and encourage regional cooperation by developing countries?	(i) Research will be designed specifically to develop technologies that small farmers can afford. The project's outreach program will ensure that these farmers receive instruction in the proper use of the new technology. (ii) N/A (iii) Yes (iv) Yes (v) Yes

b. FAA Sec. 103,103A, 104, 105, 106, 107

Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

(103) for agriculture, rural development or nutrition; if so (a) extent to which activity is specifically designed to increase productivity and income of rural poor; (103A) if for agricultural research, full account shall be taken of the needs of small farmers, and extensive use of field testing to adapt basic research to local conditions shall be made; (b) extent to which assistance is used in coordination with programs carriedout under Section 104 to help improve nutrition of the people of developing countries through encouragement of increased production of crops with greater nutritional value, improvement of planning, research, and education with respect to nutrition, particularly with reference to improvement and expanded use of indigenously produced foodstuffs; and the undertaking of pilot ordemonstration programs programs explicitly addressing the problem of malnutrition of poor and vulnerable people; and (c) extent to which activity increases national food security by improving food policies and management and by strengthening national food reserves, with particular concern for the needs of the poor, through measures encouraging domestic production, building national food reserves, expanding available storage facilities, reducing post harvest food losses, and improving food distribution.

(a) Project takes full account of the needs of small farmers and will make extensive use of field testing.

(b) Research under this project is expected to develop new varieties of vegetables and pulses which will increase yields and extend the time during which these nutritions foods will be available.

(c) N/A

c. FAA Sec. 110(1). Will the receipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter costsharing requirement been waived for a "relatively least-developed" country)?	Yes
d. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to the Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?	No
e. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental and political processes essential to self-government.	Yes. See Part II, B, C.1 and D
f. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase or productive capacities and self-sustaining economic growth?	Yes

UNITED STATES OF AMERICA
AGENCY FOR INTERNATIONAL DEVELOPMENT
Dacca, Bangladesh

Certification Pursuant to Section 611 (e) of the Foreign Assistance Act of 1961, as amended

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I, Frank B. Kimball, the Director of the Agency for International Development Mission to Bangladesh, having taken into account among other things the maintenance and utilization of projects in Bangladesh previously financed or assisted by the United States do hereby certify that in my judgement Bangladesh has the capability to effectively maintain and utilize the Agricultural Research II Project.

Frank B. Kimball
Director