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BANGLADESH AGRICULTURAL RESEARCH PROJECT PHASE-II

**1985 Internal Evaluation of the
Water Management Program Area**

S. M. Arshad Ali

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BANGLADESH AGRICULTURAL RESEARCH COUNCIL
INTERNATIONAL AGRICULTURAL DEVELOPMENT SERVICE
April 1985

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AGRICULTURAL RESEARCH PROJECT PHASE II

1985 INTERNAL EVALUATION REPORT:
WATER MANAGEMENT PROGRAM AREA

S. M. ARSHAD ALI

BANGLADESH AGRICULTURAL RESEARCH COUNCIL
INTERNATIONAL AGRICULTURAL DEVELOPMENT SERVICE

April 30, 1985

DHAKA

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1. INTRODUCTION

1.1. Background

Agriculture is the most important sector in the economy of Bangladesh, accounting for 35 percent of the GNP, 85 percent of all employment, and 80 percent of the country's export. The total area of the country is 35.3 million acres of which 22.5 million acres are under cultivation, at a cropping intensity of about 154 percent. Both surface and ground water resources remain one of Bangladesh's greatest natural agricultural assets. The control and management of this asset can lead to substantial foodgrain production increases. Properly utilized, the groundwater supplies can meet a substantial share of the cropping needs during the dry season when surface flows are at a minimum and irrigation requirements are high. Thus a tremendous expansion in irrigated acreage through proper water management practices is possible by increasing the current coverage of 20 acres per cusec to 50 acres per cusec using existing pump capacity.

1.2. Project Purpose and Objectives of Water Management Program Area:

The national goal of Bangladesh is to achieve self-sufficiency in foodgrain production. The purpose of the ARP-II, consistent with this goal, is to increase the effectiveness of agricultural research necessary for the development of appropriate agricultural technologies for Bangladeshi farmers (Contract, Appendix A, pp2).

The Water Management program area, one of the program areas of ARP-II, recognizes that most of the irrigated acreage of Bangladesh is served from small discharges ranging from 0.02 to 2 cusec; it is estimated that the area irrigated from these sources could be doubled with better water management practices. Thus the development of an engineering and social science program with a capacity to identify and solve on-farm water management problems is the main task. The objectives of the Water Management program have been made more explicit in Amendment No.6 of the contract as to:

- i) increase the water use efficiency,
- ii) improve the cost and energy efficiency of water lifting devices.
- iii) expand the irrigated command areas, and
- iv) grow more rice per cropping season and per unit of land.

1.3. Inputs and Outputs:

Consistent with the purpose and objectives, the project provides inputs of support for the development of an inter-institutional capacity under BARC's leadership to design, test, monitor, and evaluate more efficient irrigation systems, and expects the following outputs (PP Amendment, July 1982, p.8).

A. Water Resource Development

- * Increased productivity, reliability, and control of water
- * Improved water user group practices for efficient water use and management available;

- * Feasibility determinations on manual and animal operated pumps available;
- * Energy-efficient and cost-effective pump/engine combinations available;
- * Appropriate, field-tested, location-specific water distribution systems available;
- * Improved on-farm Water Management practices including optimal irrigation frequencies, irrigation schedules, residual soil moisture conservation and related tillage practices.

B. Professional Development

- * 10 persons trained to the M.Sc. degree level in irrigated agricultural systems
- * 40 individuals equipped with non-degree level training in irrigation systems
- * 720 persons trained in farm water management practices through in-country courses
- * 1200 scientists and extension personnel trained in improved water management techniques through three-day national workshops and seminars
- * Inter-disciplinary team approach established at research institutes involved in irrigation and water management activities through participation in the BARC coordinated contract research program.

C. Research Results Documentation

- * BARC annual publications on effective irrigated agricultural systems: publications would compile research results from the participating research institutes

- * Annual national language publications from individual research institutes collaborating in BARC sponsored contract research projects

D. Research/Extension Linkages

- * Field manual for field personnel responsible for siting pumps, defining command area boundaries, laying out delivery systems, coupling engines and pumps, and maintaining/servicing pumps
- * Farmers exposed to improved pumps and distribution systems through annual farmer field days
- * Increased farmer involvement in operation, maintenance, and improvement of irrigation systems
- * Field demonstration of total package of improved irrigation practices for entire command area
- * BARC Materials Media production Unit to transfer information to policy makers, professionals, and farmers

1.4. Methodology

Annual planning and implementation of activities of the Water Management area are carried out through four divisions of BARC, Soils and Irrigation, Agricultural Engineering, Economics and Social Sciences, and Crops. However, planning, implementation and evaluation of the combined activities of these four divisions during 1984-85 is presented in this report in terms of each of the following topics:

1. Specialists,
2. Expatriate Consultants,
3. Local Consultants,

4. Overseas Training,
5. In-country Training,
6. Contract Research, and
7. Commodities

Evaluation of the above was based on the documents/papers/information supplied by IADS and BARC and on information gathered from field visits to the research sites of BARI, BRRI (Joydebpur, Dhaka), Hathazari (Chittagong), BAU, BINA (Trisal, Mymensingh) as well as from visits to BARC (Ag. Engg. Division) and IADS specialists (BARC).

2. EVALUATION

BARC/IADS prepared a very systematic and detailed annual activities plan for the fiscal year 1984-85 (Second Annual Plan), which is discussed in the evaluation.

2.1. IADS Specialists:

Three specialists, accounting for 36 man-months, were to plan and develop various water management related activities and to assist BARC implement them.

The specialists have been working effectively within their terms of reference (G.B. Saird, Terms of Reference for IADS Specialists, pp.36-42) for entire FY 84-85. Dr. D. Gisselquist, Water Management Extension Specialist, has been working to expand the Water Management program by developing and carrying out activities in a number of areas, including extension, research proposals, training, economics of research, etc. Dr. C. Gancedo,

Agricultural Engineer, has worked to build up and implement activities in areas of contract research proposals, in country-training Water Management programs, procurement of commodities, etc. Dr. R.C. Lazaro, Water Management Specialist stationed at BARI, is developing and implementing contract research institutional facilities, short training courses, etc. The Member-Director of BARC, Dr. K. Azharul Haq, is a knowledgeable researcher with a dynamic personality. The combined services of Drs. Haq, Gisselquist, Sarcos and Lazaro for the remainder of the ARP II would strengthen BARC's overall Water Management research system.

2.2. Expatriate Consultants

The annual plan for 1984-85 called for 22.5 man months of expatriate consultancy services. The duration of any consultancy would range from two to eight weeks. The consultants were to design irrigation systems, assist with research on distribution systems for DTW, STW and LLP, advise on irrigation methods for upland crops, pump technology, help with studies on water measuring devices, determining availability and distribution of benefits and economic issues of irrigation, and assess the status of soil salinity and the possibility of remote sensing in agricultural research.

Nine expatriate consultants provided services against 17 planned for about 13 man-months. In addition, 7 expatriates were brought for short in-country training courses for 4.5 man-months, giving 17.5 man-months of total expatriate consultancy services against the planned 22.5 man-months.

It is worthwhile to note that the water management component provides 40 man-months of expatriate consultancy services, but by June 1985, only 29.5 man-months would be committed. It does not seem difficult to utilize the remaining 10.5 man-months in the next 2 years of the project. The expatriates usually made very valuable recommendations, but it has been observed that about 10 per cent of their recommendations appear inappropriate. This possibly was a result of their limited scope, in terms of time and assistance, to fully understand GOB policy and BARC's authority. Use of expatriate consultants in conjunction with local consultants might be helpful. Attention to this issue is needed in the future. It is good to see that some of their recommendations have been implemented and some are in process.

2.3. Local Consultants.

The annual plan did not specify the total number of local consultants to be hired during the 1984-85 plan period. The areas identified for the consultants were studies on potential crops, workshop management activities, ground water issues, manual pump inventory, economics of DTW irrigation, annotated bibliography of materials related to IWN, feasibility of increasing wheat acreage and assistance to management activities of the Agricultural Engineering, Economics and Social Sciences, and Crops & Forestry Divisions.

It is difficult to say, from the documents made available, how many local consultants could be hired and how many man-months have been utilized in FY 85. But it seems from the overall

picture that only 34 man-months (10 consultants) have been used so far against 60 man-months provided by the contract. It is the understanding of the author that local consultants are difficult to find as there is an acute shortage of highly trained in Water Management manpower in the country. BARC could look for the local consultants much ahead of the time they are needed, or alternatively, BARC may consider offering part-time consultancy arrangements so that persons willing to offer their services do not meet with "release from duty" problems from their parent institutes.

2.4. Overseas Training

The annual plan provides for one Ph.D degree program in the USA and 10 M.Sc. degree programs in TWC as well as three short term (six-month) courses in the USA and six in TWC. Five persons were to attend international conferences and more than thirteen were to study minor irrigation and large scale water distribution systems in India, Burma, Pakistan, and Sri Lanka.

During the year, all the degree programs were implemented. There are currently one Ph.D student in the USA, two M.Sc. students at AIT, Thailand, four M.Sc students at the University of the Philippines, and three M.Sc students at Central Luzon State University. Mr. S.M. Nazimuddin completed his diploma from AIT and returned to his post in December 1984.

The higher degree programs in water management are essential as there is an acute shortage of trained research manpower in the country; and the short term overseas training courses helpful

to broaden the knowledge of the scientists. It is the feeling of the author that 4 more Ph.D. scholarships are needed to meet the needs of Water Management at BARC.

Eleven persons attended 10-day overseas short courses in the Philippines and 14 attended six-month courses in the USA and TWC. There seems to be a serious problem in obtaining GOB approval for these short trips. Unless a solution can be found, the total funds allocated for this training would be impossible to utilize. Apparently, BARC has tried to obtain short-term delegation of authority (upto three months), from the GOB based on an evaluation team's recommendation in the past. Renewed effort in this respect is strongly suggested. If, ultimately, such arrangements can not be made, funds allocated to the 6-month overseas courses may be diverted to 2 Ph.D training programs in the USA.

Eight scientists went to India, Thailand, and other countries to study irrigation systems and to participate in international conferences. These tours broaden our scientists' knowledge and form an important component of research manpower development. It seems logical to expedite the remaining programs to fulfill project commitments.

2.5. In-Country Training

Eleven short term in-country training courses for durations of 2 days to 4 weeks (total 29 weeks) were planned to train Bangladeshis in on-farm water management, irrigation systems, remote sensing in agricultural research, irrigation agronomy (in

a cooperative program with DAE to develop IWM text books/training programs and courses), pump irrigation and technology, groundwater, water production function, low cost irrigation appliances and economics of irrigation. In addition, monthly seminars on irrigation water management issues and 4 workshops of 2 days each on improved distribution systems for minor irrigation, methodologies to evaluate performance of irrigation systems, electrification of irrigation equipment, and promotion of dry field irrigation crops were provided in the plan. Three sabbaticals (18 man-months) relating to studies of irrigation water management and yield production issues and 4 in-country M.Sc. programs (24 man-months) were also included in the plan.

Nine short training courses will have been held (6 completed and 3 in progress) by June, 1985 on the subjects of (1) Irrigation and water management training at BRRI with 20 participants; (2) On the job training for IICAD project staff with 16 participants; (3) pump irrigation in Bangladesh at BARI Joydebpur, GTI Mymensingh, and BARI Jessore with 13, 26 and 14 participants; (4) IWM course for SMSs and SROs of DAE with 35 participants; (5) indigenous water lift device at Salna with 15 participants; (6) water production function at BARI with 21 participants, and (7) groundwater investigation at BRRI with 17 participants. The materials presented in these short courses designed by the IADS Specialists together with BARC staff were relevant, consistent and useful for the Water Management program. The participants saw these courses as useful and expressed the

hope that such training would be continued. Commitments for FY 85 will be completely fulfilled; it would be reasonable to provide more such training in the remaining two years of the project. A short in-country (one month) internship training developed for the new Irrigation Water Management graduates of the IAD, would be very useful for scientific manpower development efforts.

The workshop and seminar plan went fairly well. Two workshops on improved distribution for minor irrigation systems and diagnostic analysis were held at BARC involving 115 participants. Three other workshops on dry field irrigation crops, electrification for irrigation equipment and methodologies to evaluate performance of irrigation systems are to be held by June 1985. Workshops, seminars and conferences are good methods of disseminating knowledge. Increased emphasis on these activities is suggested.

Three M.Sc. programs are in progress but no sabbaticals have been implemented because of some rigid rules framed by BARC. Recently, these rules have been relaxed and the sabbaticals should take place if processed early.

2.6. Contract Research

The 1984-85 annual plan recognises the following 10 on-going research projects.

1. Coordinated Micronutrient Research under Irrigated and Non-irrigated Conditions (DARI & BINA). (Extended 1 year)
2. Coordinated Soil Management-Problem Soils (BARI, BORI, BAU, DU)

3. Saline Water Irrigation and Crop Production in the Coastal Zone of Bangladesh (DU).
4. Integrated Irrigated Command Area Development Project (BAU, BAU).
5. Study of the Land Use Survey in the Irrigated Project Areas (JU).
6. Comprehensive Study of the Economic Viability of DTW Joydebpur Area (BIRRI).
7. Cropping System Defined Area Project, Jamalpur (BARI).
8. Efficiency of Bamboo Tubewells for Small Scale Irrigation and Crop Systems (BARI).
9. Study of Soil and Water Management Practices for Crop Production (BARI).*
10. Socio-Economic Study for Cropping System Research in Irrigation Projects of BWDB (BWDB).*

*These studies were accidentally omitted from the 1984-85 Wo Plan.

The plan also envisioned 9-16 projects to be approved & funded during Fy 85. Nineteen water management research topics were identified. During 1984-85, one project was approved & funded:

National Survey on Performance of Different Types of Tubewells and LFP Equipment (BIRRI).

Research and development work on Irrigation Water Management in Bangladesh is scattered among a number of institutions including BARC, BARI, BIRRI, BAU, BUET, BWDB, IRDP, DINA and BAU. Some of these institutions operate their own irrigation water

management research stations. For example, BWDB has four research stations devoted to irrigation research; yet research information gained at these stations is not permitted to be published. The number of institutions involved in water management research perplexes the person interested in research organization and management. BARC has attempted to overcome the duplication of research and lack of communication between research units by forming a task force on soil and water management. This group has produced a report (Soil-Water Management Research Inventory and Problems in Bangladesh BARC, 1979) that could lead to a national coordinated program in soil and water management. Every effort should be made by the GOB to support BARC in its efforts to carry out the aims of this research plan and to make water management research an effective tool in meeting national needs and objectives.

A word of caution is called for in planning water management research. What is needed is not a long series of experiments on consumptive use of water by various crops. Rather, what is needed is a program that will:

- * Identify when and where rainfall and water supplies are likely to occur, or to become in excess or in short supply
- * Identify major problems affecting water management at farm level, fully taking into account the institutional-cultural-technological problems of large and small farmers
- * Use agro-ecological maps of the Soil Survey Department to identify major irrigation problem areas that will lead to research programs at the policy or research station level.

- * Assemble multidisciplinary teams-irrigation engineers, agronomists, sociologists, agricultural economists- to work at the farm and village level to identify major problems and potential of irrigation
- * Develop and control surface as well as ground water resources for dependable and timely irrigation
- * Achieve effective and efficient water use; better village and farmer organizations
- * Evaluate, collate, and publish the status of irrigation knowledge in the country, including the considerable body of knowledge possessed by the farmers themselves; this exercise must be an on-going process as problems, knowledge, and perception of problems change
- * Under BARC's sponsorship, hold periodic national meetings to assess current knowledge in water management and to serve as a forum for scientific debate on the progress of irrigation in the country.

Evidence is available that BARC is addressing the above program needs and putting more emphasis and effort into contract research.

Contract research program provides a mechanism by which resources may be allocated to various research institutions depending upon their specific mandates, resources and capabilities. In addition to the obvious research function the contract research program is viewed as a powerful tool for institutional development in terms of both personnel and equipment. The total fund for the Water Management Program of

ARP-II is \$5,000,000 and that for contract research is \$900,000 (18 percent). Therefore, one would expect a significant amount of research effort. It is apparent that the Water Management program of BARC has placed great emphasis on contract research. The ARP II on-going research projects are progressing well. Besides, 25 more research proposals (Appendix A) submitted to the Water Management Cell of BARC for funding are at various stages of approval. However, for lack of time and information, evaluation of only six on-going contract research projects are included in this report.

Project: Study of Soil & Water Management Practices for
Crop Production

Research seems to have made some findings during the last 4 years in terms of the response of wheat, potato, mustard and maize to irrigation water. Experiments conducted in the EARI stations in Joydebpur (Grey terrace soil), Jessore (Calcareous flood plain soil), Jamalpur (Grey flood plain soil) and Dinajpur (Non-Calcareous brown flood plain soil) indicated crop water use of 368 to 240, 363 to 199, 120 to 94, and 376 to 360 mm. At different water stresses, trend of yield reductions were noted. For wheat, maximum yield reduction of 60 percent occurred at 0.8 bar at both crown root initiation and booting stages (yield under no water stress ranged from 2500 to 3000 kg/ha) while, for potato, maximum yield reduction occurred at 0.6 bar at early tuberization stage. A maximum yield reduction of 75 per cent occurred in Grey Terrace soils.

The results will be useful in preparing irrigation schedules for potato and wheat on the kinds of soils similar to those of the experimental sites. Such studies for rice in different soils are encouraged. Experiments conducted at Jessore and Dinajpur did not show any effect on the yield of lentil and chickpea with irrigation, whereas those at Joydebpur showed significant yield increase in Chickpea with three irrigations. This is interesting to note that on both calcareous and non-calcareous soils, irrigation to lentil and chickpea is ineffective in terms of their yields, while on grey soils for Chickpea, it is useful. Further studies should confirm such statements.

Minimum tillage gave the highest yield of wheat in clay loam soil and no significant difference in wheat yield under minimum tillage and conventional tillage practices in either silty loam soil or silty clay loam soil. Perhaps for wheat, tillage practices are not that important and possibly the present issue of "zero" tillage for wheat is scientifically logical. Of course, silty clay loam soils with well developed ploughpan would need deep tillage to facilitate higher infiltration and deeper root development specially for non-irrigated wheat cultivation.

The study has accomplished a lot and similar studies in should be taken up for rice crops.

Project: Coordinated Soil Management - Problem Soils

The objectives of the 6 components (ICRISAT with 3 components, DU, EJRI and BAU) are related to soil management viz. problem soils, their intensity, mineralogical studies, organic matter

management, effects of micronutrient, green manure and acidic soils on crop yield. Comments at the recent BARC workshop on on-going contract research projects on this project seem appropriate: (1) the achievements of this project are of little immediate value to national agriculture, and (2) no information with the exception of that generated by the component of acid tea soils is ready (after economic analysis of its practicability is made) for transfer to farmers. The workshop suggested the revision of most of the components of this project to focus on specific problems. It is expected that when revised in light of the workshop proceedings, more concrete success will be achieved in the remaining funding period. The author however, feels that the project is basically a soil management research project rather than water management. BARC is urged to fund projects in the Water Management area with more water management components.

Project: Saline Water Irrigation and Crop Production in the Coastal Zone of Bangladesh

The project started in February 1984 after considerable delay because of manpower availability problems. During the last year, three experimental sites in Khulna, Noakhali, and Patuakhali have been selected, and some field experiments with BR-10 were conducted at Sonagazi (Noakhali) during Kharif season under different levels of brackish water. Heavy rainfall occurred during the experiment and eliminated the soil salinity effect on crops which resulted in an insignificant difference between the various treatments.

The theme of the work is consistent with more crop production. Soil experiments to assess soil-water salinity effects need to be conducted at a time when the occurrence of rainfall is insignificant, if not zero. Dry season- experiments in farmer's fields would be appropriate. The effect of different levels of salinity at different stages of crop growth needs to be incorporated in the study. More projects in this direction need to be funded by BARC from ARP-II, expanding the area of such studies over the entire southern saline belt of the country.

Project: Integrated Irrigated Command Area Development Project

The project has 2 components, one at BAU and the other at BARI. The BAU component has three sites in Mymensingh and the BARI component has five sites in Dhaka, Mymensingh and Chittagong. The project started in January 1984, 6 months behind schedule mainly because of problems in releasing funds. During the last 15 months, nearly all bench mark information has been completed and the systems have been put to experimentation. From the author's visits to both Mymensingh and Chittagong sites, the following observations are presented:

1. The site selection for the Hathazari (Chittagong) experiment was probably not appropriate. The system is working with about 34 acres of command area for rice with 1.1 cusec of discharge from a DTW which runs about 8 hours a day. Water losses in the command area could not be measured with conventional cut-throat flume method due to topographic problems; however, some alternatives, like the lysimetric method, inflow-outflow method, etc., may be alright. Another

problem that was mentioned is that the command area can not be increased much because of limited available agricultural land. Since relatively little equipment has been installed, there may still be time to choose a more suitable site for the experiment. The BARI component is seriously lacking research manpower.

2. The BAU component of the Command Area Development Project has 3 sites. The areas commanded by these sites were originally 26, 50 and 80 acres for rice. It has been documented that now these have increased to 50, 75 and 80 (no increase) acres. Conveyance loss of 60 per cent has been determined in the Trishal area where the command area was lowest (26 acres) with a pump discharging at 1.78 cusec for 8 to 10 hours a day. Farmers expressed their happiness over the expansion of the command area, which was accomplished by diverting the restrained excess water through a culvert built across the Dhaka-Mymensingh highway. The PI of the project said that attempts would be made to increase the command area further by compacting the distribution channels and thereby reducing the excessive conveyance loss. The project seems to be progressing well.

Project: Comprehensive Study of Economic Viability of DTW in Joydebpur Area.

The project began in July, 1984 and has accomplished some start-up activities, such as mapping of all DTWs of EADC in Joydebpur zone and selection of sites for 10 DTWs for detailed technical and socio-economic survey. Site preparation work is in progress at Joydebpur and Feni.

The study seems to be timely and relevant. There are about 16,000 DTWs, and 94,000 STWs in the country and many issues are on the floor about the future of irrigation wells. Although the project has just started and consequently not reached a stage of evaluation, much is expected from the study in terms of our use of ground water to increase crop production. At this point, one might raise the question of the duplication of such studies but the author believes that such duplications are possibly necessary as long as they are not conducted in the same groundwater aquifer zone.

Project: Efficiency of Bamboo Tubewells for Small Scale Irrigation and Crop Systems.

To increase crop production, Bangladeshi farmers need low input technologies: irrigation technologies which are cheap, and simple to maintain, operate and repair are likely to be adopted. The objectives of the bamboo tubewell research project are relevant to the purpose of the ARP-II (WMA) and the farmers' need. The study has shown that at a cost of Tk.800-900/well, 6 to 11 gpm of discharge is possible with a command area of 0.3 acre for rice to 1.0 acre for wheat. The life span of these wells lies between 3 and 6 years. The initial findings sound encouraging. The treadle and rower pumps which were specially developed for irrigation purposes and cost substantially less than other pumps being used in this project should also be studied. The feasibility of adoption and use of the bamboo tubewells must be studied from the socio-economic point of view as well as from an engineering standpoint. Progress made so far,

however, seems satisfactory.

2.7. Commodities

The plan provided for procurement of commodities both from the local market and overseas for infrastructural development of different research institutes, specially, the Irrigation Engineering Section of BARI and for updating library materials including an annotated bibliography of Irrigation Water Management research.

Locally available materials for surveying and water measuring devices were provided to help implement contract research. A list of commodities (library materials, laboratory materials, field equipment) from different research institutes was made and ordered; some have already arrived according to the Agricultural Engineer. In addition, Irrigation Water Management Section of BARI has been provided with a pipe test bed. Most of the research institutions do not have adequate laboratory and field equipment, specially BAU due to shortage of operational funds. The status of the 5 utility vehicles needs to be clarified. Providing commodities to the institutions will facilitate contract research and, develop manpower skills. It seems that total funds for commodities will be inadequate for the next 2 years of the project. Diverting some funds from contract research (or 6-month short term overseas training) in favour of commodities would prove useful.

3. ISSUES AND CONCERNS

The overall purpose of ARP-II requires the building of capabilities to get more agricultural research activities into the farmers fields where production problems can be identified and solutions tested and the building of strong responsive core discipline research programs to develop the new technologies that can address these problems (project papers). In view of this broad requirement and the activities related to 1984-85 annual plan in Water Management Program area, the following issues and problems emerge:

A. For carrying out research successfully, it is a prerequisite that the research institutes under the BARC umbrella viz. BARI, BRRI, BINA and BJRI and those beyond, like BAU, BUET, DU, BWDB, etc. be capable of conducting the research both from the point of view of scientific equipment and research manpower. Institutes intending to conduct water management research would require soil moisture meters (neutron probes, tensiometers, etc), water measuring devices (flumes, weirs, notches, etc.), precision weighing balances, ovens, flow measuring devices (current meters), avometers, surveying equipment, etc. Most of the research institutes do not have this equipment, particularly the universities. Although these items can be purchased from the commodities heading of ARP-II, the long process of making the request, getting it approved, ordered, imported/locally purchased, released and finally getting it to the institutes is painstaking. On the other hand, the shortage of highly trained manpower capable of conducting effective water management research is acute. For

example, IARI has about 600 scientists on the payroll but 16 of them are attached to the Agricultural Engineering Division and only 3 of them are trained in Water Management. IINA has only 2. In IARC itself, only 2 individuals (including the present Member-Director) are trained in Irrigation and Water Management. There is an urgent need to immediately develop the research facilities of the institutes as well as the trained research manpower in the irrigation water management.

B. The potential of groundwater resources must be fully assessed and developed. At present, 11 per cent of the country's total cropped land is being irrigated from groundwater sources. With full development groundwater resources have the potential to irrigate 34 per cent of the net cropped area if the present rice dominated agriculture regime is continued. If a rice-wheat cropping regime is pursued (which seems could happen in the near future), the nation's groundwater resources can help increase the irrigated acreage to 50 per cent. This means that development of groundwater resources has become vital for the country. The GOB's groundwater development strategies in the Second Five Year Plan have increased the total number of DTWs to about 16,000 and STWs to about 94,000. Mere installation of this equipment will not serve the purpose of irrigating more land as has been proven. About 20 per cent of the DTWs are not functioning at all and most of the rest are discharging water much below their rated capacity. Many STWs are either pumping sand, running dry, or pumping less water than they should. Thus the command areas of both the DTWs and

STWs are much below their potential. Studies on the mismatch of pump and well, discharge-recharge and yield potential of groundwater aquifers, well density, spacing and abstraction rates, and effects of the present well development technology on discharge etc. are some of the areas where much more systematic research efforts are needed. It is encouraging to note that a number of proposals have been submitted to BARC and some are awaiting decisions of the BARC's Finance Committee meeting. Funding of the projects that fall within BARC's Water Management priority areas would be appropriate.

- C. There is no provision in ARP II for supply of vehicles to the research institutions. However, lack of vehicles seriously constraints many research efforts. BARC needs to purchase vehicles/foreign made equipment with funds from other sources, such as IDA funds.
- D. The issue of fund-release seems to be a very critical problem. Because of this many projects could not start in time and are not running well. Recognising the fact that there are some complications to resolving this issue, BARC is urged to negotiate with AID and the research institutions to develop a suitable framework within the Bangladeshi context, BARC may also consider providing a better monetary incentive to the project PIs. The present policy does not foster commitment nor attract many potential individuals to contract research.
- E. The total fund allocated to the Water Management area of ARP-II is \$5,000,000 (about 23 percent of the total ARP-II funds)

which, many believe, is too much to absorb. Keeping in mind the GOB policy regulations, it is hard to send many Bangladeshi scientists abroad for short term (6-month) training and similar travel as provided in the contract. At the same time, keeping in mind the limited number of trained research personnel and research facilities in the country, it seems also difficult to utilize \$900,000 (18 per cent of the total Water Management fund) on contract research. Therefore, it would be logical for BARC to reappropriate within the WMI Program Area some funds from contract research and some from overseas short-term training in favour of 4 Ph.D degree programs and more short in-country training courses.

4. CONCLUSIONS

The activities begun between July 1, 1984 to June 30, 1985, presented in this report, indicate that accomplishments in the Water Management Program area have been satisfactory with respect to the expected project outputs as laid down in the Amended Project Papers. For example:

- A. The Water Resource Development project component has increased the number of contract research projects and handled many distinct contract research projects, viz. the Integrated Irrigated Command Area Development Project, the Comprehensive Study of Economic Viability of DTW in Joydebpur Area, the Efficiency of Bamboo Tubewells for Small Scale Irrigation and Crop Systems, the National Survey on Performance of Different Types of Tubewell and LLF Equipment. In addition, funding for

more water resource development related contract research projects and proposals for short training courses on water resources development were considered.

- B. The Professional Development component has provided opportunities for 14 individuals to pursue higher studies in Irrigation and Water Management (Ph.D and M.Sc. degree programs). Ten short term Water Management training courses for 183 individuals were organized up to June 1985);
- C. In Documentation of Research Results, the Water Management program has produced many BARC publications on Irrigation Water Management research activities as well as many consultancy reports related to water management; and has initiated an IWM annotated bibliography.
- D. In Strengthening the Research/Extension Linkages, the program component has provided training to 25 subject matter specialists and subject matter officers of the Department of Agricultural Extension of GOB and created avenues for farmers' participation in Bamboo Tubewell and Command Area Development Projects.

These activities would lead one to conclude that an acceptable number of accomplishments have been made in the 1984-85 period and that the Water Management Program area of BARC's research system is functioning comparatively smoothly. Activities performed in different line items during this period are more or less in time and of adequate quantity except the 6-month short term overseas training and staff travel which suffered mainly

because of the ODB rules. The number of short in-country training courses was, however, more than adequate. The quality of the short training courses, workshops, and consultancy services is reported to be high.

It would be reasonable to expect that the Water Management Program area will reach a satisfactory level of accomplishment in the future.

5. RECOMMENDATIONS

1. Arrange for the services of local consultants in conjunction with those of expatriate consultants. Process cases of hiring local consultants early. Part-time local consultancy may be considered.
2. Make budgetary adjustments within the IWM Program Area between line items as needed; reappropriate funds for contract research and 6-month overseas training in favour of long term higher training, short overseas courses, short in-country training courses and commodities. Develop an in-country internship training system for new Irrigation and Water Management graduates of BAU.
3. Consider providing monetary incentives to the Project PIs and arrange for transport to be used in water management research from some less restrictive fund source.
4. Fund more contract research proposals with water management components: ground water development, saline water intrusion and irrigation water quality studies.

5. Provide more Senior Scientific Officer/Scientific Officer(s) in the Water Management Cell of BARC.
6. Resolve fund release problem and cut down the long time consuming procedures of research project approval and funding.

Summary of Activities, Budget, and Expenditures
from July '84 - March '85

Target Activities	Budget, FY '85*	Activities accomplished/committed	Spent	% spent
A. <u>Technical Assistance</u>				
a. Specialists 36 mo		3 individuals 36 mo		
b. Exp. Consultants 22.5 mo	388,125	13 individuals, 17.5 mo	208,500	54.9
c. Local Consultants,	32,500	4 individuals 7 mo	13,277	31.6
d. Evaluation	5,200		7,597	151.9
B. <u>Training</u>				
I. <u>Overseas</u>				
a. 1 PhD, 10 MSc Programs	61,800	1 PhD, 10 MSc :		
b. 6 month, 14 individuals	62,450	10 day each, :	69,249	45.7
		11 individuals :		
c. Study travels/Conf. 18 individuals	27,800	8 individuals :		

	151,250			
II. <u>In-country</u>				
a. Short training, 11 courses, 29 wks	225,000	9 courses for 172 :		
		individuals* :		
b. 4 workshops/monthly seminars	7,500	2+3 workshops 115 :	153,332	65.20
		individuals* :		
c. 3 Sabbaticals, 18 mo	2,685	3 MSc :		
4 MSc program 24 mo	-----	(includes USU expenses)		
	235,185			
C. <u>Contract Research</u>				
a. 8 On-going + 9-16 to funded	228,700	11 On-going	94,936	41.5
D. <u>Commodity</u>				
Institutional Development Library Materials	263,200	Pipe Test Bed (DARI) Lab. & Lib. Materials	133,834	50.5

	1,295,760		681,725	52.5

* Includes commitments up to June, 1985

IWM PROGRAM AREA
CONTRACT RESEARCH PROPOSALS
(AS OF APRIL 4, 1985)

No.	Code	Title (Institution)
1.	PSI-10-WM	Soil/Water Salinity Projects - 3 projects (BWDB).
2.	PAE-01-WM	Study on the Effect of Intensive Deep/Shallow Tubewell Installation on Groundwater research and Safe Yield (BRRI).
3.	PAE-02-WM	Performance Evaluation of Different Type of Manual Pumps in Farmers Fields (BRRI).
4.	PAE-03-WM	Determination of Human Energy Expenditures and Identification of Ergonomic Characteristics of Manually operated Pumps (BRRI).
5.	PAE-04-WM	Performance of Different Draft Animals under Varying Loads and Climatic Conditions in Bangladesh (BAU).
6.	PAE-05-WM	Comparative Study of Cost and Efficiencies of Manual, Animal and Power Pumps under Specific Field Conditions (BAU).
7.	PAE-06-WM	Effective Pump-Irrigation Systems for Bangladesh as Referred to Command Area Development (BUET).
8.	PAE-07-WM	Improvement of Supply, Delivery and Distribution of Tubewell Water Using Reservoirs (BARC)
9.	PAE-08-WM	Mechanization Strategies in Pump and tubewell Irrigation Systems in the Socio-Economic Context of Bangladesh (BAU).
10.	PAE-09-WM	Groundwater Resource Assessment for Development Planning of tubewell Irrigation System in Tangail Area (BAU).
11.	PAE-10-WM	Recharge and Depletion Characteristics and Irrigation Water Quality of Mukttagacha Aquifers (BAU).
12.	PAE-11-WM	Irrigation System Design and Development of Irrigation Scheduling (BRRI).

13. PAE-12-WM Studies on Aquifer Parameters for Groundwater Movement in Choosing Appropriate well spacing and Density (BINA).
14. PAE-13-WM Studies on Groundwater Fluctuation and Aquifer Parameters for Groundwater Resource Assessment and Selection of Appropriate Well Spacing (BARI).
15. PC-07-WM Maximization of Citrus Fruit Production through Orchard Management Practices (BARI).
16. PC-08-WM Fertilizer and Water Use Efficiency under Different Inter-cropping System (BINA).
17. PC-09-WM Land Use Maximization Through Intensive Cropping Using Alternative Irrigation and Drainage Technology (BINA).
18. PC-10-WM Efficient Utilization of Surface Water from Boro Biler Part of BAU Program (BAU).
19. PESS-07-WM Economics of Shallow Tubewell Irrigation (CU)
20. PESS-08-WM The Distribution of Benefits from Irrigation to Ownership and Management of Irrigation Equipment (CU).
21. PESS-09-WM Management of Irrigation Equipment By Cooperatives informal Groups and Individual (BARD).
22. PESS-10-WM Study on History of Irrigation System in Comilla.
23. PESS-11-WM Economics of Supplementary Irrigation for Kharif and Rabi Crops (CU).
24. PESS-12-WM Response to Shallow Tubewell Running Dry Due to Declining Groundwater Levels (CU).
25. PESS-13-WM A Socio-Economics Study of Gravity-fed Irrigation System in Bangladesh (CU).

REFERENCES

- BARC. Soil Water Management Research Inventory and Problems in Bangladesh, 1979.
- Moseman, A.H. et. al. Report of the Review Team, Bangladesh Agricultural Research System. July 18, 1980.
- AID. Bangladesh Agricultural Research Project Phase II (388-0051) Project Paper and Annexes, 1980.
- AID. Bangladesh Agricultural Research Project Phase II (388-0051) Project Paper Amendment and Annexes, 1982.
- Karim, Z. Second Annual Report--Coordinated Irrigation and Water Management Studies, 1981-82.
- Cushing, R. L. Annual Plan, I - July 1981-82, II - July 1982-83. Consultancy Report, December 1982.
- Anderson, Jack R. et. al. Report of the May External Evaluation Team. Bangladesh Agricultural Research Project-Phase II, May 1983.
- Gill, G.J. Agricultural Research in Bangladesh: Costs and Benefits. Bangladesh Agricultural Research Council, 1983.
- Chaudhuri, S.D., S.M. Arshad Ali, and M.A. Hamid 1983 Internal Review of BARC's Irrigation Water Management Research Program. Consultancy Report, October 1983.
- Karim, A.Q.M.B. et al. An Evaluation of the Research Program of Soil Science and Water Management in Bangladesh Agricultural Research Institute, November 1983.
- BARC. Priorities for Research in Irrigation Water Management. Soils and Irrigation Division, Bangladesh Agricultural Research Council, December 1983.
- BARC. National Agricultural Research Plan 1984-1989. Bangladesh Agricultural Research Council, May 1984.
- IADS. Bangladesh Agricultural Research Project-Phase II Annual Work and Financial Plan 1984-85, September 1984.
- BARC. Proceedings of the First Workshop on the Progress of On-going Contract Research Projects (Draft) January 1985.

- IADS. Bangladesh Agricultural Research Council ARP II. Budget Comparison Statements. International Agricultural Development Services, January 1985.
- IADS. Bangladesh Agricultural Research Project-Phase II. Six Month Progress Report VII (July-December 1984), February 1985.
- IADS. Bangladesh Agricultural Research Council ARP II. Budget Comparison Statements. International Agricultural Development Services, March 1985.

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