Irrigation Development in Bangladesh:  
Socioeconomic Issues and Evidence

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The earlier development of minor irrigation depended heavily on the actions and supports of the government. In the backdrop of very slow growth of irrigation under public sector domain, rice production suffered. Since late 70s, a series of policy reforms have been pursued by the government to liberalize the market for irrigation equipment and to create opportunities for the private sector to play more roles in the development of minor irrigation. The major policy reforms in irrigation included: (i) liberalization of imports and distribution of irrigation engines and spare parts; (ii) rationalization of duties and taxes on irrigation equipment import; (iii) removal of engine standardization restrictions; (iv) withdrawal of tubewell spacing and siting regulations, and (v) withdrawal of subsidies on irrigation equipment prices. Recently, financial and technical supports have also been extended to promote supplemental irrigation for Aman rice in the drought-prone areas. Adherence to these policies has been committed in the National Agriculture Policy, 1999 of the Ministry of Agriculture.

The most significant impact of the market liberalization and privatization policy has been a marked reduction in prices of engines and other irrigation equipment, which means that irrigation equipment are now much more widely available and affordable to the farmers. Local workshops have grown rapidly to manufacture spare parts and provide repair services for irrigation equipment (Mandal 2000). This has led to a rapid growth of irrigated area at the rate of about 8 percent per annum since 1991/92. The growth of irrigation has been propelled by Shallow Tubewell (STW) whose number increased from 235,900 1988/89 to 757,044 in 1999/00. STW area grew from 0.94 million hectares in 1988/89 to 2.64 million hectares in 1999/00. This meant an average annual growth of around 14 percent in STW irrigation, which covered 81 percent of groundwater irrigation, 64 percent of minor irrigation and 59 percent of total irrigation in 1999/00. Growth of low-lift pump and major canal irrigation was moderate, while there has been virtually no growth in DTW irrigation. In 1999/00 total irrigated area stood at 4.48 million hectares, which accounted for around 64 percent of approximately 7 million hectares of cultivated land. Groundwater irrigation technologies as a whole (i.e., STWs, DTWs/FMTWs) covered about 73 percent of the total irrigated area.

There are inter and intra-regional variations in the extent of irrigation development. For example, NMIDP census of minor irrigation shows that while the districts of Bogra,

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1 The views expressed here do not necessarily represent those of the Planning Commission for which the author works.

1 Minor irrigation is currently the most dynamic private sector which involves about 1.7 million full or part owners/managers of mechanized irrigation pumps with another 0.76 million owners and operators of unmechanized and traditional irrigation devices. Added to this are about 0.16 million rural mechanics who are engaged in installation, repair and servicing of irrigation pumps and engines (Mandal 2000).
Jaipurhat, Naogaon, Dinajpur, Rangpur, Gaibandha, Chuadanga and Tangail have experienced relatively higher growth of minor irrigation than other areas with high groundwater potentials. The variations are attributed to the socioeconomic conditions such as farm size and land tenure systems as well as physical conditions such as agro-ecological characteristics, groundwater aquifers, expansion of equipment market at the local level, growth of physical infrastructure and provision of electricity.

The growth of irrigation has also been influenced by the availability of institutional credit. In areas where bank loans are either insufficient or difficult to obtain, the growth of irrigation market has been generally slow. In areas with intense competition for command area plots, a new form of partnership arrangement has emerged for taking up irrigation as a business enterprise. But this should not be seen only as a credit market failure. There is a whole range of valid socioeconomic rationales behind choosing partners in irrigation business in a highly competitive environment, especially in a complex rural setting. The major reasons for choosing partners include: mobilization of enough capital for purchase and operation of irrigation machines, meeting kinship or social obligation, enlarging and protecting a viable command area with partners’ land and social supports, and acquiring adequate financial and moral strengths to do water selling business without threat of encroachment from the competing pumps (see Mandal 2000).

Profitability of irrigated agriculture is the overriding factor affecting the expansion of irrigation. An earlier study by Mandal et al. (1995) showed that very low paddy price in 1993 Boro season in Faridpur discouraged many farmers from growing irrigated Boro rice in 1994. A recent NMIDP census of minor irrigation revealed that high price for Aman rice in the previous season encouraged the potential investors to respond quickly to food grain shortages (reflected in high prices) by increasing the number of irrigation units and command area per unit of equipment (NMIDP 2000). Therefore it is important to maintain a favorable price regime for food grain as well as other irrigated crops.

The growth in minor irrigation has directly contributed to an acceleration of food grain production from about 18 million tons in early 90s to over 26 million tons in 2000/01. This has been possible mainly through a rapid surge in Boro rice production.

The growth in minor irrigation has led to the emergence of a rapidly expanding irrigation water market, which has largely been competitive and more efficient than before. Irrigation privatization has also significant positive equity implications as more and more small and medium farmers gained increased access to irrigation benefits through ownership of tubewells and pumps whose prices dropped. The increased access of the small farmers, facilitated by significant reduction in prices of irrigation engines and pumps, broke away the monopolistic control by the landed rich or ‘water lords’ as earlier studies epitomized it referring to DTWs (for an elaborate discussion on dynamics of irrigation water market see Mandal 2000).

As irrigation coverage is expanding, more and more unfavorable and difficult lands are being put under irrigation, meaning that profitability from irrigation is likely to decline if on-farm water management is not improved or more diversification to high value crops does not take place. The added concern is the recently observed arsenic contamination with groundwater—a subject, which is much talked about but least known yet. Be that as it may, it is important for the country to develop surface water irrigation and to improve its management so that pressure on groundwater abstraction for irrigation purposes is minimized.
INAGURAL AND TECHNICAL SESSION

A National Workshop on the proposed Study “Pro-poor Intervention Strategies in Irrigated Agriculture in Asia: Bangladesh” was held at the Bangladesh Unnayan Parishad (BUP) Auditorium, Dhaka on 23 June 2001. The workshop was organized by BUP in association with the International Water Management Institute (IWMI), Sri Lanka. It was participated by about 40 experts and professionals, representing all major government and non-government organizations working in water sector, academic institutions, and donor organizations of the country (A list of participants is given in Annex).

The workshop began with a brief address of welcome by Dr. Q.K. Ahmad, Chairman of BUP. He explained the purpose of the workshop and also the overall objective of the study. He invited all the participants to contribute towards firming up the approach and the methodology of the proposed study. Following his remarks, Dr. Abdus Sattar Mandal, Member of Bangladesh Planning Commission made a presentation on “Irrigation Management in Bangladesh: Socio-Economic Issues and Evidence.” He commented that minor irrigation has so far contributed the most to the overall irrigation development in the country. Dr. Mandal made a graphic presentation on agro-ecologically constrained regions with limited scope for development of irrigation. He also talked about socioeconomic constraints such as land tenancy and problems associated with share cropping, low economic return from paddy, and difficulties in marketing the produce. He commented that if the link between the issues of large-scale contamination of shallow ground water by arsenic and groundwater irrigation could be established or even if the evidence of arsenic entering into the food chain is established scientifically, then groundwater irrigation development would face a tremendous set back; but that link is yet to be established.

Dr. Intizar Hussain of IWMI made a presentation on the study. Dr. Hussain first introduced IWMI, and then presented an overview of the purpose and scope of the study. He identified the following two important factors with respect to pro-poor interventions in irrigated agriculture: (a) skewed distribution of benefits of irrigation; and (b) unsatisfactory performance of irrigation systems, involving poor management, unreliable water supplies, inefficiency and inequality in water use, poor maintenance of water infrastructure, financial dependence for running the system etc. He pointed out that there are regional and spatial differences in the types of problems. He commented that it is generally found that the poor performance in irrigation management is to a large extent due to non-technical factors and the study would probe into those issues. He then discussed the purpose and scope of the study. The following four aspects highlights the scope of the study, as described by Dr. Hussain.

- The study would analyze, through field research, the impacts of the current policy and institutional frameworks, and the impacts of underlying physical, economic,
and sociocultural conditions on the selected areas and on the overall irrigation system at large.

- The study would assess opportunities and constraints on improving productivity in these areas through improved access to irrigation water.
- The study would identify and evaluate a range of potential pro-poor interventions at the field and system levels against a set of criteria including cost of implementation and potential to reduce poverty.
- The study would formulate a set of appropriate interventions and policy and institutional frameworks, including adequate support systems, necessary for ensuring large-scale uptake, replicability, and higher impacts on poverty.

Following the two inaugural presentations, there was an open forum where the participants raised questions or asked for clarification on the two presentations. The representative of the Asian Development Bank (ADB), Dhaka mentioned that the ADB was in the process of carrying out two studies in medium and small-scale irrigation projects which might provide valuable insights that this study may find useful to draw upon. In general, the participants expressed their satisfaction that this study proposed to address relevant and topical issues. However, given that poverty is a complex and multi-faceted phenomenon, specification of the link between poverty and irrigation alone could be a very difficult task.

Participants attached high research priority to institutional issues of irrigation management. It was suggested that research on such issues should also encompass minor irrigation in addition to surface water irrigation schemes since the former happens to be the major form of irrigation in the country. In the discussion, lack of adequate marketing facilities and limited access to land were also highlighted as major issues for research.

After a brief break, the second technical session started with a presentation on the Ganges-Kobadak (G-K) Irrigation Project, the largest irrigation scheme in operation in the country. The presentation was made by Mr. M. Noajesh Ali, a BUP consultant, who was formerly the G-K project Manager. He gave a description of the project and its management programs. He explained why the project needed rehabilitation and what has been done so far. He also explained how local people and the beneficiaries were involved in the decision-making processes by the formation of Water User Associations (WUA) within the project area. Mr. Ali showed how WUAs could facilitate irrigation development through a participatory process of project management at the farm level. He also commented that there exist ample opportunities for further improvement.

Following the presentation, the participants raised questions and offered comments. Uneven elevation of land, lack of availability of water in the Ganges, lack of access to water in the tail-ends during dry season, poor management, and transformation of surface water irrigation system into groundwater irrigation during low flow conditions in major rivers were identified as major problems of the G-K project. The other relevant issues that were raised by the participants include: (a) sedimentation and volume dredging, (b) problems of land consolidation, (c) cost recovery, and (d) availability of power to run the operations.

The next presentation was made by Dr. M.K. Mujeri of BIDS, a specialist on poverty issues, on “Poverty Alleviation through Improved Irrigation Practices: Bangladesh Perspectives.” Dr. Mujeri reviewed the past achievements of agricultural performance and
irrigation development. He mentioned that groundwater irrigation accounts for about 70 percent of all irrigated lands in Bangladesh. He pointed out that surface water irrigation is currently enjoying large subsidies compared to the groundwater irrigation systems, but the realization from these schemes is poor, even though the water charges are very modest. Dr. Mujeri visualized a future pattern of agricultural growth and mentioned aspects in which pro-poor irrigation interventions could be focused. He explained that the growth in demand for cereals will decline and demand for non-cereal crops will increase in future. He put emphasis on a shift from cereal to non-cereal crop production. He also argued that non-farm activities should be facilitated in addition to diversification of crops. He suggested that issues concerning inadequate and unreliable water availability at the tail ends should be given high priority towards formulation of pro-poor irrigation intervention strategy. He commented that opportunities concerning improvement of water use efficiency at the farm and system level should be explored.

Dr. Zahurul Karim, Secretary, Ministry of Livestock and Fisheries, Government of Bangladesh and former Chairman of Agriculture Research Council (BARC) made a presentation on the “Role of Irrigation towards Achieving Food Self-Sufficiency in Bangladesh.” Dr. Karim informed the workshop that almost 80 percent of irrigation involving both surface and groundwater is directed towards a single crop: Boro paddy. He called for revisiting the past irrigation policies and exploring new ways of growing more food by expanded/improved use of irrigation. He mentioned that there are many areas suitable for non-cereal crops; these potentials should be explored towards crop diversification. He said that transferring cereal growing lands to high-value non-cereals could also help reduce rural poverty. He informed the audience that the BARC established a GIS database, which could be utilized for developing a number of technology packages depending on ground realities.

Dr. Karim mentioned that increased production alone would not ensure increased income for the poor farmers. Promotion of agro-business with value addition at the grassroots level and enhancing of market facilities should be given due emphasis. He suggested that poor farmers should be empowered technologically, and that there are technological packages available in the National Agricultural Research System (NARS). He said that Farming System approach involving the homesteads, particularly of the poor households, as production centers for increasing production of various crops should be considered in order to face the challenges of the future.

The post-lunch session started with a brief presentation by Dr. Q.K. Ahmad, the Team Leader of the proposed study in Bangladesh. Dr. Ahmad explained the framework of the study, which revolves around the nexus of thematic issues: (a) poor irrigation performance, (b) low agricultural productivity, (c) low access to land, and (d) poverty. He also said, as did Dr. Hussain earlier that the study will focus on non-technical interventions, focussing on macro, meso and micro levels as appropriate. He mentioned that micro-level information will be collected through field surveys and PRAs, while meso-level information will be generated through interviews and review of available documents. He also explained that an attempt will be made to examine how macro-level policies affect the poor farmers at the micro level. The issues of coordination among different levels and the role of local government system in irrigation management will also be examined in the study.
Following the presentation by the Team Leader for the Bangladesh component of the study, the participants were invited to take part in a brainstorming session on the issues, the approach and the methodology of the study. The outcome of the brainstorming session is presented below.

**BRAINSTORMING SESSION**

The brainstorming session, chaired by Executive Director of BUP Mr. Khalilur Rahman, started by considering the general guidelines provided by IWMI. The participants were requested to discuss the major poverty related research issues in irrigated agriculture in Bangladesh. It was mentioned that both types of poverty prevailing in the country should be taken into account: (a) absolute poverty which may be described by using income levels as indicator; and (b) relative poverty which gives an idea about inequality.

In the case of irrigated agriculture, a question was raised as to whether poverty would be compared within the system and between systems or before and after project or with and without (control area) project. In view of non-availability of poverty related data before the project/irrigation system was implemented, a comparison between before and after project cannot be made. It was opined that a comparison of poverty situations in agricultural areas with and without irrigation systems could be done, but this would not serve the purpose at hand; and the approach also suffers from methodological complications. It was agreed that comparisons between water-surplus, water-adequate, and water-scarce areas within an irrigation system and among corresponding areas between irrigation systems would be the best option for the purpose at hand.

It was pointed out that there are three types of benefits from irrigation that may accrue to the poor families: direct, indirect, and derived; and it was suggested that consideration be given concerning the inclusion (in the study) of non-crop agriculture in addition to crop agriculture.

The workshop identified means of improving productivity of the irrigation systems as one of the key areas of research interest. In this regard the workshop identified the timing of pump operation as one of the key aspects. Questions were raised relating to access to irrigation by households located at different locations. It was suggested that the effectiveness of the design of the irrigation systems be examined. The former Director of the G-K project informed the workshop that only about 60 percent of the farming households get irrigation water during the dry period in the G-K project due to nonavailability of adequate water vis-à-vis the required water level for running of the pumps. Therefore, there were seasonal inequities in the distribution of water and some people could not derive stipulated benefits from the irrigation system.

It was suggested that the study should examine availability of inputs, including adequacy and timely availability of financial resources and other types of support and quality of inputs as barriers towards improvement of productivity in the irrigation systems. The participants made the point that pro-poor, targeted management-related interventions should be examined in the study. Possible opportunities for multiple use of irrigation systems, especially in terms of paddy-cum-fish culture, which might help improve the poverty situation within the project.
areas, may also be considered. In addition, opportunities for canal bank afforestation should be examined as a means of increasing incomes of the poor families.

The workshop suggested that issues relating to increase of cropping intensity be studied including, if appropriate, conjunctive use of surface and groundwater. It was also suggested that this might be relevant for certain specific areas within the project. Whether the poor were included in the decision-making processes in managing the irrigation systems was another research area identified by the participants. The legal basis of the formation and activities of the Water User Associations (WUAs), with particular emphasis on their registration process, should be taken on board, it was suggested. Participants also suggested that cost recovery for the irrigation systems, giving due emphasis on the processes of cost recovery, be included in the study. The process of formation of WUAs was also identified as one of the research issues. The participants suggested that it would be useful to examine how the WUAs were formed, whether or not there were democratic processes involved and whether or not those were linked with the local government bodies. As a general guiding principle it was suggested that the information should be obtained by involving the local people in the process. Participants were in agreement that there were some problems related to inter-institutional coordination and for an improved management; such problems should be identified and remedies sought.

For selecting irrigation projects for the study, a number of criteria were identified which include age of the project/richness in experience, mode of water supply, water availability/adequacy/scarcity, experience in irrigation management transfer (IMT) through WUAs, experience in Command Area Development (CAD), pricing system, cost recovery, productivity and poverty situation. Based on the deliberations, a matrix was developed, which would help cross-examine various key aspects of different irrigation projects in Bangladesh for selecting projects out of the seven named in the workshop.

The participants considered indicators for defining poverty in Bangladesh at length. The workshop was informed that the government documents usually use income levels and the size of landholdings as two indicators of poverty in the country. It was also suggested that the housing condition could be another indicator of poverty. It was pointed out that a large proportion of the poor people are ultra-poor (defined with reference to lack of access to 1805 Kcal); in terms of housing they would be in a rather precarious condition. The participants also discussed a number of indicators for measuring irrigation system performance. Following are some of the indicators discussed: (a) water distribution efficiency, (b) command area, (c) cropping intensity, (d) crop yield, (e) existence and functioning of WUAs, (f) cost recovery, and (g) degree of institutionalization of WUAs.

While discussing the probable design of the study, it was agreed that a comparison between ‘before’ and ‘after’ project(s) would not be suitable for the study. It was agreed that, with and without irrigation comparison would not also serve the purpose of the study. After long deliberations, it was agreed that comparisons between water-surplus, water-adequate, and water-scarce areas within the irrigation system and among corresponding areas between irrigation systems are the best options for the purpose at hand.

It was decided that a questionnaire survey at the grassroots, facilitated/supplemented by group discussions, as appropriate, by means of Participatory Rapid Appraisal (PRA) and interviews with knowledgeable respondents within the project area and project personnel could be parts of the general methodology. It was also suggested that the irrigation water
distribution accounting for the selected systems should be done in order to evaluate system performance.

The final discussion topic involved identification of projects for study. G-K and the Pabna Irrigation systems were selected after considering the criteria evolved during deliberations.

The discussion was concluded with a vote of thanks by the IWMI representative and also by the BUP Chairman.

**PRE-WORKSHOP FIELD VISIT**

The workshop was preceded by a visit to the G-K project. Dr. I. Hussain of IWMI along with Mr. Khalilur Rahman, Executive Director of BUP visited the G-K Project in Kushtia district on 21 June 2001. Dr. Hussain and Mr. Rahman were received by the Project Director of the G-K Project, Mr. Hasan Zubair, at Kushtia. The Project Director briefed them about the project activities and accompanied them during the field visit. The visit was made to the pumping plants of the project, intake channel, the Ganges river, which is the source of water for the G-K project, and the canal systems.