An Overview of Irrigation and Rural Poverty Issues in Bangladesh

Nityananda Chakravorty[1]

Introduction and Background

Out of a potential area of 7.56 million hectares for irrigation, the present coverage of major and minor irrigation in Bangladesh is about 4.0 million hectares. The share of surface water irrigation is only 1.15 million hectares while the groundwater share is the bulk of 2.85 million hectares including minor modes of irrigation. The projection for such coverage on the terminal year (2002) of the current Fifth Five-Year Plan (1997–2002) is around 5.0 million hectares.

To put the poverty profile in Bangladesh in brief, extreme poverty prevails among 22.7 percent of rural households and moderate poverty among 29.2 percent. Besides these, another class of the poor with vulnerability to income erosion comprises about 21 percent. This poverty situation has followed more or less a trend of decline in the recent past. Another characteristic development is the decline of malnutrition, which reached the lowest in 1996, especially in agriculture and manufacturing sectors. Irrigation development has played a significant role in causing this decline over time, but has greater potential if technological rigidities of irrigated crop culture could be overcome.

Given the importance of rice production as a prime national objective and as a source of current income and employment for the rural sector in Bangladesh, this will still remain about 67 percent of the potential area and, in addition, the irrigation development will need supportive flood control and drainage provision to allow for high-yielding varieties (HYVs) to sustain in this vast floodplain of the biggest river systems of the world: the Ganges, the Brahmaputra-Jamuna and the Meghna.

One major issue regarding pattern of investment in irrigation projects is that direct public irrigation investment has, in recent years, been much less-important than in the past. In other words, efficiency of private irrigation has increased. The dominant form of ownership is small scale and private in irrigation. This precludes the extension of irrigation at a large scale under the public sector any more because of the much rigidity like slow and cost-prohibitive cost-recovery process, absence of group-management culture, regulated allocation of water and the absence of a notion of a water market. Thus, gradual withdrawal of the public sector from the irrigation sector will require more resources through an appropriate government action like the provision of greater autonomy to public/private agencies for carrying out research for sustained growth of irrigation.

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[1]Economist, Bangladesh Unayan Pradesh (BUP), Dhaka, Bangladesh.

Large-Scale Irrigation in Bangladesh

The development of large-scale public-sector projects on surface-water irrigation in Bangladesh is mainly the responsibility of the Bangladesh Water Development Board (BWDB). The share of this large-scale irrigation in the total achieved coverage is only about 7 percent through the provision of surface water from large projects (see appendix 1). Although more than 70 percent of the irrigated area is being served by groundwater through deep tube wells (DTWs), shallow tube wells (STWs), deep set shallow tube wells (DSSTWs) and other groundwater modes, the apprehension about groundwater scarcity by the end of 2005 (as warned by the FAP study) has underscored the importance of conserving surface water for irrigation and ecological sustainability. It has been found from the NWP water balance study during the late eighties that only 5 percent of available surface water flow is withdrawn for irrigation during the driest period of a year (March). It is envisaged that without building large dams or barrages across large rivers, this withdrawal can only increase up to 15 percent and it can be further enhanced up to 35 percent only with large barrage interventions. This withdrawal rate has been considered as the determinant of maximum area for surface-water irrigation. And that is why the current Fifth Five-Year Plan (1999–2002) has set high priority for planning and implementation of the Ganges Barrage project in Bangladesh.

As for the efficiency of large-scale surface-water irrigation projects in Bangladesh, it is observed that the realized efficiency of these projects is around 50 percent of its designed efficiency. This fact acknowledges the importance of optimization of irrigation facilities. Reasons for the underperformance in large irrigation projects are summarized below:

1. Technical limitation of the installed irrigation infrastructures including pumps in full- scale operation.
2. Scarcity or unavailability of water at sources.
3. Want of command area development programs within irrigation projects.
4. Dearth of adequate funds for O&M activities on a sustainable basis.
5. Lack of planning and resources for rehabilitation or replacement of relatively old irrigation infrastructures.
6. Lack of appropriate beneficiaries' organization for effective O&M of project facilities.
7. Absentee owners of relatively larger holdings have less response to the needs for increasing irrigation efficiency.
8. Wastage of irrigation water due to suboptimal use and indifference of users about the economic value of water in the context of its increasingly competitive market.

Small-Scale Irrigation in Bangladesh

Privatization and import liberalization caused profuse growth of STWs. Some observers dubbed it as the *quiet revolution.* The DTWs have not been able to win the test of economic viability as was initially envisaged. Even the Grameen initiative on these in northern Bangladesh failed during the late 1990s. It has been the unfavorable economics of DTWs in the agro-ecological context of Bangladesh that started their gradual departure from the farmers' arena. Besides these, hand TWs, force mode TWs, DSSTWs and very deep set STWs also comprise the minor mode with, however, a very modest coverage. The total coverage under groundwater irrigation has been 2.85 million hectares (about 70%) out of the total coverage of 4.2 million hectares under all modes of irrigation in Bangladesh.

A Comparative Assessment of Current Irrigation Status by Major Types

The relative significance of each type of irrigation can be captured by putting the coverage under each mode of irrigation by groundwater and surface water sources. Figure 1 represents the comparative strength of each mode, representing also the economic preferences of users. It is evident from figure 1 that augmentation of surface water and dependence on groundwater from the deeper aquifers for irrigation have been the dominant strategies to sustain agricultural growth.

Poverty Impact of Irrigation Projects: An Overview

Poverty is perennial but irrigation water is not. Poverty does no more bind itself within the walls of food and there are other kinds of food than bread. It is, therefore, difficult to functionally relate poverty with irrigation, which is only a fraction of inputs for food production for alleviation of food poverty.

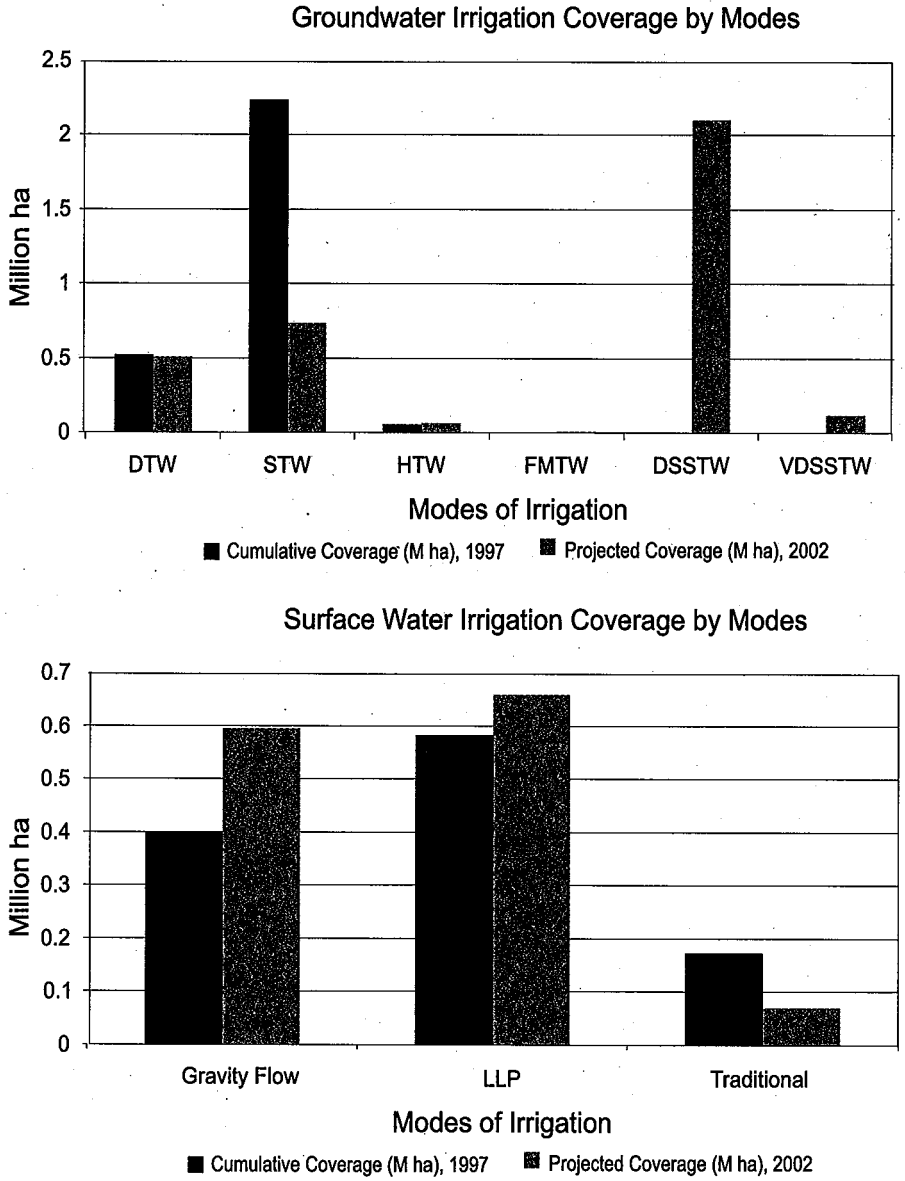
If poverty has its root in income, irrigation can influence it favorably but indirectly through growth projects in the economy. If it has a nonincome root, even then irrigation can indirectly influence it through capacity-raising programs in issues like technological adaptation in agriculture, integrated pest management, etc.

The most recent estimate of the Human Poverty Index (HPI) has dropped more than 20 percent during last 15 years (1981 to 1997). It remains to be examined as to how far irrigated agriculture has contributed to this decline.

The spread of high-yielding varieties of agricultural crops has a strong influence on agricultural growth. How far this influence benefits the poor farming class and the landless households depends upon the rate of higher labor requirement and yield per hectare.

A shift from local to HYV rice culture normally elevates the pattern of labor employment by 45 percent and the yield rate by at least 10 percent. This favorable influence does not speak much about poverty alleviation when consumption data are considered. Moreover, the technological adoption process also incurs some substantial default, which pulls the potential growth rate down to the pseudo-production level. Thus the process of benefiting the poor gets handicapped by technological limitations.

Figure 1. Comparative strength of each mode.



DTW = deep tube well; STW = shallow tube well; HTW = hand tube well; FMTW = force mode tube well; DSSTW = deep set shallow tube well; VDSSTW = very deep set shallow tube well.

Pro-poor irrigation development has offered itself to very limited experimentation for long in Bangladesh. While food self-sufficiency is a national goal, it does not automatically address poverty through irrigation development. This is because withdrawal of subsidies from the agricultural input market (including irrigation water) has put the smallholders in agriculture in unfavorable terms of trade. Irrigation management systems also do not lend themselves to any magnanimous options for involving the poor or the landless people. Nor have the

persistent efforts for strengthening antipoverty institutions and for removing institutional hurdles against social mobility of the poor come out successfully yet. If we look back to the financial and economic performance and potentials for irrigated transplanted varieties of food grains (boro, aus, aman and wheat), we can mark a significant drawdown in financial and economic cash flow, yielding a suboptimal net returns to investments in irrigated crops due to underperformance of technology. Table 1 demonstrates that normal yields, net financial returns and net economic returns (in 1996 prices) are far less achieved in practice than the potential values.

Table 1. Normal and potential yields, net financial returns and net economic returns.

Irrigated food grains	Yields (tons/ha)		Net financial returns (Tk/ha)		Net economic returns (Tk/ha)	
	Actual	Potential	Actual	Potential	Actual	Potential
Boro (HYV)	4.36	5.29	7,697	20,769	13,013	35,000
Aus (HYV)	3.34	3.57	6,479	11,778	8,889	16,000
Aman (HYV)	3.50	5,50	9,550	25,197	12,262	32,000
Wheat (HYV)	2.16	3.04	2,774	8,190	9,256	27,000

Source: Bangladesh agricultural growth with diversification: Prospects and issues.

The above table shows that actual yields are lower by as much as 18 percent, 6 percent and 36 percent for boro, aus and aman rice, respectively. Accordingly, financial and economic returns also show a heavy setback for the actual values when compared to the potential values. The actual yields of wheat are lower by 28 percent.

This raises a serious issue of sustainability of the HYV crop culture in the long run, unless a more commercially oriented crop diversification from rice to other crops takes place. And this is one of the basic reasons why poverty reduction has not been obtained through irrigation of major crops in Bangladesh.

A serious research is, thus, a necessity on broad-based agronomic, economic, social and ecological issues on how winter or *rabi* (dry season) season agro-ecology can be optimized through low-cost technology for crop diversification (from boro to other commercially viable crops) and how the second *kharif* (wet season) season can be tapped for cash crops like cotton, jute, sugarcane, fruits and vegetables.

Tax-Poverty Interface in Irrigation Systems

In the case of surface water systems, market-based allocation of water is often opposed by the farmers who own head water rights (along the main and secondary canal systems) under the initial stage and by those farmers again who have been getting their water for free. In the case of groundwater, the problems of overexploitation from a social point of view and its costly technology handicap its economic use by small and poor farmers in Bangladesh.

Therefore, an appropriate institutional setting is critical for investing in water-conserving and water-conveying technology and for efficiency in water use. By this institutional setting, we mean an institutional system that provides holders of water rights adequate incentives for improvement of the irrigation system.

The notion of "free water" has almost vanished, yielding place for "priced water," where the holders of water rights may have a share in the profit made from the sale of water. Scarcity of water and technological change have started widening the scope of the water market even in the developing countries. Sometime in the future, "marginal productivity" (of a unit of water) rule may soon come up to govern the water market. In that case, poverty reduction as a strategy through irrigation projects may not be relevant. But the underlying strength of the water-market system may help alleviate poverty through cross-subsidization among the cross sections of water users (including poor, small and marginal farmers), if an appropriate institutional setting can be put in place.

Concluding Remarks

Given the poverty reduction syndrome historically observed, the pace of income (consumption)-poverty reduction has been slow (see Bangladesh Economic Policy Paper No 1, ADB, June 2000). Irrigation development has been reasonable during the last three decades. Therefore, irrigation as a passage towards alleviation of poverty, is still hard to conceive except when we consider an indirect influence of increased food production and unskilled labor employment in HYV crop culture stimulating the current income of the poor.

Irrigation, both surface water and groundwater, has its ceiling, beyond which nature's monopoly operates. So, technological innovations for low-cost, equitable and ecologically friendly irrigation systems, and effective institutional development for participatory water management can play an important role in indirectly alleviating income-poverty.