Design Issues in Farmer-Managed Irrigation Systems

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Crop-Share Payment System in Farmer-Managed Irrigation Projects in the Tangail District of Bangladesh

M.T.H. Miah[1]

ALMOST ALL CULTIVABLE land (8.9 million hectares [ha]) in Bangladesh is now under crop cultivation and there is little scope for bringing new land under crop production (BADC 1981). In addition, the amount of cultivable land is gradually decreasing because of other infrastructural and industrial-development activities. The only feasible way to increase agricultural production is to increase intensive cultivation and assure the efficient and judicious use of scarce resources. As part of the effort to increase agricultural productivity farmer-managed minor irrigation projects such as deep tube wells and shallow tube wells have been introduced in Bangladesh. The main advantage of these projects is that they are less capital-intensive, are feasible for small landholdings, and are capable of increasing production more quickly than in large-scale irrigation projects (Biswas 1985; Miah 1987).

In Bangladesh a farmer can acquire a deep tube well by renting one from the Bangladesh Agricultural Development Corporation for a fixed yearly charge, or buy one from the government or a nongovernment organization. Criteria were defined by the Corporation for approval of the acquisition of a tube well which included conditions regarding the minimum amount of land to be irrigated and the minimum distance required between tube wells.

To obtain a picture of the status of tube-well irrigation systems ten shallow tube wells and ten deep tube wells were surveyed in 1986, selecting Basail *Upazila*, Tangail District as the site. All but three deep tube wells had been purchased by managers (owners, or representatives of owners who sell water to farmers). These three had been rented from the Bangladesh Agricultural Development Corporation. The deep tube wells had been installed between 1976 and 1984 and the shallow tube wells between 1982 and 1985.

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[1]M.T.H. Miah is an Associate Professor in the Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh.

Despite the criteria set by the Corporation none of the deep tube wells complied with the requirements and most shallow tube wells violated the requirements as well. The average command area of a deep tube well was 16.4 ha in 1984 and that of a shallow tube well in the sample was 5.8 ha. The average command areas gradually decreased from 1984 to 1986 to 15.5 ha for deep tube wells and to 5.0 ha for shallow tube-wells, respectively, resulting in considerable underutilization of potential services. Inappropriate government policies that made it difficult for farmers to have access to the tube well services and profiteering by managers have been blamed for the trend of reduced command areas.

Starting in the late 1960s, the experience had been that farmers paid the full amount of water charges in cash either at the beginning or within the period of rice cultivation. The managers bore all investment and operation and maintenance costs of the tube-well projects. About 40 percent of the farmers did not pay their water charges on time or at all. As a result, the managers were reluctant to supply adequate water to the crops of those farmers with unsatisfactory payment histories. Hence, the crop yields of those farmers diminished, making it even more difficult for them to meet their obligations. This feature was a chronic problem in these small irrigation systems.

In the mid-1970s a crop-share payment system for water was initiated by a few managers of Basail Upazila which has been successful in increasing crop yields and farm incomes. Under this new system the managers bear all investment and operation and maintenance costs of the tube-well projects in exchange for 25 percent of the harvest of high-yielding variety (HYV) boro rice from each client farmer. Since the managers' profits are directly and proportionately related to crop productivity they have an incentive to see that water is applied appropriately to assure a good yield. Under this system water supply has been improved and there are hardly any farmers who default on their water payments. Farmers prefer this system because they do not have to pay water charges during the period of rice cultivation when they need cash for agricultural inputs, and the managers prefer the system because they have the opportunity of obtaining higher returns. A recent study by Miah (1987) shows that farmers in these projects are making profits from the cultivation of HYV boro rice. Farmers using deep tube wells are making slightly higher net returns per hectare (US$47 [Tk 1,546]) than farmers in shallow tube well projects (US$39 [Tk 1,283]).

The internal financial rate of return of tube-well projects from the managers' viewpoint, considering average command areas in 1986, was three to five times higher than the true opportunity cost of capital. Managers of diesel-operated deep tube wells achieve an internal financial rate of return of 48 percent, those of electrically operated deep tube wells achieve 54 percent, and diesel-operated shallow tube well managers have an internal rate of return of 74 percent. This implies that these projects are highly profitable to the managers/owners of the tube wells, and the crop-share rate should be less than the existing 25 percent. Policymakers should pay immediate attention to determine a reasonable crop-share rate equitable to all.

In conclusion, the government policy on selling tube wells through various organizations may have some advantages due to the competitive nature of the market. This policy, however, is one of the causes of gross violation of the recommended spacing- and command-area requirements for the projects. Policymakers must pay attention to the matter so that proper utilization of tube wells can be assured.

Since this paper is based on only ten deep tube-well and ten shallow tube-well projects in low-lying areas of Bangladesh the results should be interpreted cautiously if any further generalizations are sought for different regions with distinct topographies.

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