

RESEARCHING VILLAGE IRRIGATION SYSTEMS IN SRI LANKA

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INTRODUCTION

The Government of Sri Lanka emphasizes as its main agricultural policy goal the need to achieve self-sufficiency in food. The government has adopted two main strategies to reach this target: the expansion of the area under food crops -- mainly rice -- under major irrigation schemes, and the intensification of agriculture on lands that are already under cultivation.

With substantial financial and technical aid from foreign donor agencies, massive investments are being made to develop large-scale irrigation schemes to bring new land under cultivation and to improve the efficiency of existing schemes. For example, in the 1981-85 Program of Public Investments, Rs 29 billion¹ (US\$1.04 billion) was allocated as capital expenditure for the Mahaweli Development Project, while Rs 3.6 billion (US\$128.6 million) was allocated for the development of all other irrigation works (Economic Review 1986:3).

The expansion of new rice lands is now facing natural limits. Therefore, the government has to pay more attention to a strategy based on the intensification of agricultural production on existing cultivated land. In this respect minor irrigation systems² can play a vital role as over 50 percent of the total irrigated land is fed by village tanks (small reservoirs) and *anicuts* (weirs).

Moreover, it is believed that the rehabilitation of minor irrigation systems, which are scattered in many parts of Sri Lanka, will: 1) arrest to some extent, the economic disparities between regions; and 2) control inflationary pressures that have been created by highly capital-intensive, long-gestation irrigation schemes.

However, current investments for the improvement of village irrigation systems show a lack of understanding of the technological, managerial, and organizational issues pertaining to minor irrigation systems. This is a result of a lack of appreciation of the socio-economic changes that have been taking place at the national level and within the confines of small-scale village irrigation systems, and of the myopic policy that these systems have somehow remained unchanged and display attributes of continuing strong social cohesiveness that can be tapped for purposes of irrigation management.

In fact, the World Bank, which finances the Village Irrigation Rehabilitation Program (VIRP) stresses the importance of going back to traditional practices of water management in order to correct certain weaknesses in the water management programs introduced during the post-independent era by different governments. The World Bank (1981:4) notes:

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With the passage of the Paddy Lands Act in 1958, its subsequent amendments, and its replacement by the Agricultural Lands Act of 1973, the Government attempted in various ways to replace the traditional system with elected committees under official sponsorship. During the 1960s, this system appears to have functioned fairly well, but further administrative changes weakened the effectiveness of the elected committees, with the result that the traditional system of control was undermined without being replaced by an effective alternative. Recognizing this, the present government has abolished the system of elected committees, *replacing it with one which in some ways returns to traditional practice* (emphasis added).

Such a return to traditional practices is evident in the water management programs introduced recently under rehabilitated village irrigation systems. Some components of the program were introduced on the assumption that they had contributed to improving the efficiency of village irrigation in the past and their renovation would improve irrigation efficiency in the present. This assumption derives from two interrelated conclusions about the village community: 1) mechanisms of efficient water management did play a vital role in village irrigation systems in the past, and 2) village communities still are structurally the same, making it possible and desirable to reintroduce the traditional mechanisms of water management.

This paper specifically deals with institutional aspects of water management programs under recently rehabilitated village irrigation systems. It attempts to highlight the characteristics of the village community within which traditional mechanisms of water management operated in the past with some success, the factors that have changed these characteristics, and the socio-economic factors operating in village irrigation systems today and how they clash with certain institutional mechanisms that were introduced under the current water management programs. In doing so, the paper makes a case for further research into different aspects of the village community and irrigation management.

The paper is divided into the following sections: 1) rationale for present investments in village irrigation rehabilitation programs; 2) current approaches to village irrigation management; 3) historical overview of village irrigation activities during the latter part of the 19th century; 4) discussion of the appropriateness of some components of the present water management programs both from social and economic view points, and 5) some possible areas for research on village irrigation management.

RATIONALE FOR PRESENT INVESTMENTS IN VILLAGE IRRIGATION REHABILITATION PROGRAMS

Since the 1970s, investments in village irrigation systems have been substantial (Table 1).

Table 1. Investments (in million Rupees) in village irrigation schemes, 1950-82.

Period	Amount
1950-54	16.4
1955-59	11.0
1960-64	6.4
1965-69	23.3
1970-74	70.4
1975-79	196.6
1980-82	285.4

Source: Economic Review (1986:5)

The rationale for the revival of village irrigation systems springs from several factors. Village irrigation systems can be cost effective, can increase farmer income, and can reduce drought related risks.

Cost effective. Village irrigation systems account for about 54 percent of the 450,000 hectares (ha) under irrigation, carry 35 percent of the paddy extent, and contribute 22 percent of the rice production (Gunadasa et al. 1980). The government and foreign donor agencies have estimated that of some 23,000 village irrigation systems in the country only about 50 percent are in working condition, while 30 percent of the irrigable area remains utilized or under-utilized for rice cultivation. It is estimated that about 50,000 ha of new lands can be brought under cultivation by refurbishing existing village irrigation systems. This means that 50,000-75,000 farmer households can be provided with adequate irrigation facilities without resettling them (ibid.). Such a program is cost effective as the average cost of village tank rehabilitation is estimated at Rs 10,000/ha (US\$357/ha), which is about 20 percent of the cost for developing a hectare of irrigated land under the Mahaweli Development Project (Economic Review 1986:8).

Increased farmer income. Low average yields and small land parcels characterize irrigated lands under village irrigation systems. As a result, the socio-economic conditions of farmer households have deteriorated. And, from a welfare perspective, there is an urgent need to improve irrigation facilities through the rehabilitation of village irrigation systems so that the majority of rural households can earn more from their paddy holdings.

Risk reduction. In the past, villagers cultivated rice mainly for family consumption and seldom sold any in the market. Nearly every household cultivated a *chena* (slash and burn) plot, and this reduced the subsistence risks associated with frequent droughts in the Dry Zone. At present the government does not allow villagers to cultivate *chena* in many parts of the Dry Zone. Also, increased population pressure has increased the demand and

limited the land available for chena cultivation. As a result, many farmers now depend exclusively on their paddy holdings to earn a living. To assure water for two seasons a year the government intends to refurbish structures and introduce a water management program for village irrigation systems.

DIFFERENT VILLAGE IRRIGATION REHABILITATION PROGRAMS IN SRI LANKA: THEIR OBJECTIVES AND STRATEGIES

The following four village irrigation rehabilitation programs are of primary interest: Village Irrigation Rehabilitation Project (VIRP), Integrated Rural Development Project (IRDP), Anuradhapura Dry Zone Agricultural Project (ADZAP), and Small Reservoir Village Community Rehabilitation Program of the National Freedom From Hunger Campaign (NFFHC).

Although the volume of investments and the geographical spread of rehabilitation activities vary, the water management activities of the first three programs are similar to each other. Therefore, for the purposes of this paper, these three will be treated as one approach to village irrigation rehabilitation. Thus, one may identify two main approaches or strategies to village irrigation rehabilitation programs in Sri Lanka: state-sponsored programs and non-governmental organization (NGO) sponsored programs. The NFFHC is the prime example of the latter approach.

State Sponsored Village Irrigation Rehabilitation Projects

Village irrigation rehabilitation projects have two distinct components: the physical rehabilitation of irrigation structures and the implementation of a water management program. The former is carried out by the Irrigation Department and the latter is implemented by the Department of Agrarian Services (DAS) with the help of farmers, who are the beneficiaries of the program. The assumptions behind these projects are: 1) farmers do not have the necessary capital or skills to launch a physical rehabilitation program to improve the irrigation efficiency of their village water source, whether tank or anicut, even if they desire to do so; therefore, 2) the government should intervene to refurbish village irrigation systems; and, 3) because the village irrigation systems are still operated as communal property, the government should allow the community to operate and maintain them.

Physical rehabilitation work includes desilting tanks, strengthening tank bunds, repairing and improving sluices and spillways, and installing measuring devices (to measure discharges and evaluate seepage losses), and on-farm development to facilitate water management activities.

Each rehabilitated tank or anicut is supposed to have a water management program. These programs share the same objective of making efficient use of rainfall and tank-stored water for cultivation of the command area. This is done in two ways: improving the dependability of the water supply, and sharing water equitably among farmers in the command area.

NGO-sponsored Village Irrigation Rehabilitation Program

The NFFHC has undertaken the restoration of abandoned tanks in the Dry Zone through its Small Reservoir Village Community Rehabilitation Program. The NFFHC is a voluntary agency which receives financial support from the European Economic Community (EEC). It operates under the auspices of the Ministry of Agricultural Development and Research.

The main objectives of the program are: 1) to improve the living standards of poor rural communities by restoring their irrigation tanks; 2) to revive ancient customs which, in the past, assured the maintenance and repairs of the village tanks; and 3) to reduce chena cultivation by providing an assured supply of irrigation water to cultivate rice lands in the command area of village tanks.

The NFFHC handles the refurbishment of tanks, and all earth work is done by the farmers under the supervision of the agency's technical assistants (TA). Villagers are paid for contributed labor at the rate of 50 percent of the standard payment prescribed for the Irrigation Department's laborers.

Farmers are solely responsible for the operation and maintenance (O&M) of their village tank. They are members of a reservoir council (RC) and all the decisions regarding the operation of a tank lie with the RC, which meets two to three times a month. Each farmer contributes two bushels of unmilled rice per acre (41.75 kilograms per 0.4 ha) per cultivation season to a common fund called the Reservoir Maintenance Fund to meet the costs of maintenance and repairs to the tank.

STRATEGIES FOR WATER MANAGEMENT AT THE VILLAGE LEVEL

The water management program carried out by the DAS has two main components: improved agricultural practices and system management. The first includes dry sowing of rice in *maha* (wet season) with early rains; plowing immediately after *maha* and *yala* (dry season) harvests to facilitate early land preparation for the following season; growing subsidiary food crops in *yala*; and promoting short-duration rice varieties in both *maha* and *yala*.

The system management component includes establishing farmer organizations for O&M and for implementing water management programs; cultivating only part of the command area during periods of water shortage; implementing a rotational water supply system with a fixed delivery plan; and allocating water to tail end areas before head end areas.

The tanks that have been rehabilitated by the NFFHC are generally small and irrigate about 20 ha each. The stored water in a tank is used to prevent crop failure during dry spells within a cultivation season. These tanks do not need an elaborate water management program because only an average of 20 households control and use the water in the tank (Wijetunga 1986:9).

Water management programs are supposed to guarantee (sic) at least a minimum amount of food and income to all farmers in the village at all times. Some components of the water management package are claimed to be derived from traditional customs and agricultural practices which were in existence during the pre-modern period of irrigation history in Sri Lanka. The prevalent belief is that these customs and practices had evolved over several centuries and had promoted community cohesion and a form of subsistence ethics in Sri Lankan villages. Therefore, the adoption of these practices, policy makers believe, would allow farmers to cultivate their paddy lands regularly on a cooperative basis.

VILLAGE IRRIGATION REHABILITATION UNDER BRITISH RULE

Because many references are currently made to past experiments in irrigation water management as a basis for new institutional mechanisms and agricultural practices, it is worth discussing the salient features of British policy and practices in village tank renovation exercises, particularly during the second part of the 19th century.

British irrigation policy for village irrigation systems reflected a combination of paternalism and self-interest: paternalism because the colonial government felt an obligation to help the peasants through investment in irrigation works and self-interest because it believed that this would resolve the food crisis and guarantee peace and order in the countryside at minimum cost. Officials argued that for the cost of restoring one major tank, which would benefit a few villagers, several small tanks could be repaired to benefit many villagers. Thus, priority was given to village tank rehabilitation. In the 1870s, the British discarded their initial principle that public works should be judged solely by their capacity to generate revenue. This allowed many benevolent and energetic officials to refurbish abandoned tanks all over the Dry Zone, and marked the beginning of a process of encapsulation (sic) which linked the entire country with the central administration.

The village tank restoration program had two distinct phases: the rehabilitation of physical structures such as sluices and tank bunds, and the O&M of the tank for efficient water management. The activities of the first phase were guided by the policy that the government should work along with the villagers and that their feelings, habits, and interests should be respected in doing so. Support from villagers in the form of labor and money was also provided. Thus, from the late 1860s, the approach to restore village irrigation works consisted of two components: monetary contributions and technical supervision by the government, and voluntary local labor and the payment of "water rates" by the farmers. This was known as the "grant-in-aid" system.

With regard to institutional arrangements for irrigation water management, the British rulers attempted to reintroduce what were presumably traditional forms of village social organization, such as *gamsabhawa* (village council), and activities such as compulsory labor in community work. They hoped that this would promote village cooperation and increased agricultural production, while remaining consistent with the British policy of indirect rule (Perera 1985a, Abeyratne 1986a).

These ideas were very evident in the Paddy Lands Irrigation Ordinance of 1856. However, the Ordinance was framed in general terms as these customs varied from region to region and the government agent (GA) was given powers to decide which customs were applicable to his area of authority.

Generally, the GA or his assistant convened a public meeting at his own discretion or, more often, at the request of at least 10 cultivators in a district to determine by majority vote whether ancient customs relating to irrigation and cultivation of paddy lands should be revived. The customs would then be defined by a committee of cultivators with the help of government officials. The customs became rules only after they were accepted by at least two-thirds of the general body of cultivators, after which the rules were sent to the governor for his ratification. Such rules were binding on all cultivators. A *vel vidane* (village irrigation headman) was elected by the village community to supervise the water distribution and the maintenance of headworks and channels, and to report wrong-doers to the gamsabhawa. A breach of rules was investigated by the gamsabhawa, which comprised 3-13 cultivators, and a representative of the GA. The guilty cultivators were fined. Many of these rules became very popular. For example, in Badulla District, there was a rule that requested the *vel vidane* to inspect the village tanks three times a week. Another popular rule was that a cultivator could hold Crown Land as private property on condition that he cultivated it regularly (Balasingham 1968:74).

These institutional mechanisms brought many changes in water management practices. Provided with masonry sluices, villagers began regulating the flow of water from the tank. The crude, wasteful habit of cutting bunds was largely abandoned. With strengthened bunds and proper spills, the tanks retained more water and as a result, paddy cultivation expanded rapidly. Farmers who used to cultivate only a portion of their holdings due to water shortage, now began to cultivate the entire area, and some bought additional land. Thus between 1870 and 1900, several thousand hectares of new land under restored village tanks were sold by the government at the rate of Rs 25.00/ha (Rs 10.00/acre).

Between 1856 and 1904, an estimated total of Rs 13.5 million was spent on irrigation works of which over 90 percent was allocated to village irrigation. As a result, during this period, paddy acreage increased from 160,000 to 240,000 ha. Rice production also increased rapidly. For example, between 1874 and 1877, annual rice production increased from 73,499 to 313,465 bushels (1,533.9 to 6,542.0 metric tons). This allowed the government to collect more grain tax from the peasants and the latter, according to Governor Gregory (1872-1877), became more healthy and resumed habits of industry (Bastiampillai 1970).

Until the 1930s, several factors facilitated the smooth functioning of the gamsabhawa and the efficient performance of the *vel vidane's* duties at the village level. The village was a closed community. In other words, many aspects of the village -- economic, political, and familial -- took place primarily within the socio-geographic context of the "natural" village. Thus, the village was, in a sense, a "community of fate" which allowed its members little mobility or choice.

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In a traditional village there was congruence between the status rankings involved in the different sets of activities of its members. Thus the *vel vidane* was one of the biggest landlords in the village, was elected by the villagers as their principal officer, and was legitimated by the GA to oversee village agricultural and irrigation matters. He possessed every attribute and power to devise his own strategy of water management. Together with the village headman, he possessed administrative experience which assured confidence in the exercise of authority. Generally the *vel vidane* was better educated and well-connected with outside influentials, and better-off economically than others. These traditional attitudes of loyalty and respect convinced others to accept his leadership as right and proper (Perera 1985b).

The village community also acted as a moral community. Single caste, single *variga* (kindred group) identities made every villager a shareholder of the village estate and its appurtenances, such as common grazing lands, reservoirs, and forests. The villagers considered themselves to be one group of relatives. Therefore, each had a moral obligation to help the other and subsistence ethics prevailed as a social insurance against draught, wild animal damage, and the encroachment of outsiders on their property. This cohesion, in turn, allowed them to enjoy various cooperative activities such as *bethma* (cultivating only a portion of the paddy tract communally due to the scarcity of water), *attam* (exchange labor in paddy cultivation), and *kaiya* (cooperative labor).

Villages were also expected to be self-sufficient in food and security. Remoteness, lack of communication, and illiteracy made them self-dependent. Heavy dependence of the community on the irrigation system for agricultural and domestic needs induced them to take part in planning and restoration of village tanks on a communal basis.

These characteristics of the village community began to change after the 1930s as a result of the rapid penetration of State activity into rural areas, the concomitant process of politicalization, with the introduction of universal franchise and secret ballot, and the substantial devolution of administration to the locally-elected ministers.

The British colonial rulers believed that the security of private property was essential for establishing a suitable foundation for agricultural development. Ordinances such as the Waste Land Ordinance of 1840 and its amendment of 1897 were enacted to ensure the security of land tenure and to protect Crown Land from encroachment. The implementation of these ordinances caused far-reaching changes in the village communities. For example, the ordinances required the mapping out of all types of land in the villages and, as a result, cadastral surveys were made and the ownership of ancestral land was regularized and demarcated from Crown Land. When the government refurbished village tanks, they too became Crown property. "As a result, the State was in a position to redefine the hydraulic community boundaries, sometimes permitting the *asweddumization* of new lands by outsiders who had access to them at public auctions"³ (Abeyratne 1986a: 5). The introduction of new concepts of property, redefinition of the boundaries of the hydraulic community, and the emergence of village land as a marketable commodity disturbed the traditional village social structure and value system.

In the 1930s, the functions thought proper to central government began to grow as a result of the process of politicalization. The development of communication, market networks, transport facilities, and welfare agencies opened the hitherto closed village community and made it a part of the wider economic, social, and political system (Perera 1985b:181).

These changes in a sense transformed the village community to a "community of choice" from a "community of fate." This process resulted in a gradual decline in the autonomy of the "closed" natural village community, diversification of occupation and income structures, the decay of extended kinship systems (such as the *variga*, which bound villagers by various obligations), and above all, an increase in the mobility of the villagers. In place of a subsistence economy and the barter system, a money economy and attendant values gradually penetrated the villages. In the sphere of irrigation, village boundaries expanded to cover more paddy lands beyond what could be irrigated by the village tank. Such paddy lands became essentially rainfed and therefore not dependent on irrigation water (Abeyratne 1986).

INCONGRUENCE BETWEEN POLICY AND RESEARCH: A CASE FOR FURTHER STUDY

Under the current village irrigation rehabilitation programs, the government does all physical rehabilitation work and expects farmers to take part in irrigation-related tasks subsequent to rehabilitation. By doing rehabilitation work with minimal consultation of farmers, the government has managed to concentrate and consolidate its role in village irrigation systems. This is radically different from the tank rehabilitation activities under the British. Previously the government made a single-shot investment in village irrigation systems and thereafter withdrew, leaving villagers to operate and maintain these systems. Moreover, physical rehabilitation was carried out with the help of villagers. Such a strategy of intervention did not disrupt the villagers' perception of village property as the government intervened only to facilitate their communal activities. But now the continuous and increased intervention of the government leaves little doubt in villagers' minds as to who owns their irrigation systems.

In recently refurbished village irrigation systems, the majority of the villagers believe that the government owns the irrigation system and is therefore responsible for ensuring system O&M. Thus, it is difficult to expect farmers to act as if they were the owners of irrigation systems and to look after these systems as a community. This difficulty is further aggravated by the gradual erosion of many of the characteristics of traditional closed village communities. Although policy makers believe that the village community is still traditional and closed, except for its manageable size and typically homogeneous character, in reality it has changed radically. Thus a water management program premised on the expectations that farmers would act according to the traditional norms of community organization, which emphasizes communal property and the exclusiveness of the village, is destined to be unsuccessful.

A second related point of misfit between policy and research is that several components of the water management program under the rehabilitated village tanks and anicuts are designed on the basis of the technical information available at research stations. Such information is often not applicable to village irrigation and agricultural systems and, as a result, these activities set targets which are high for villagers to achieve given the economic, technical, and environmental problems that prevail in remote villages.

Below are some of the components which appear to be the basis for many water management programs and which are introduced to demonstrate the kinds of difficulties that arise when policy prescriptions are premised on certain expectations of the socio-economic and cultural environment, expectations which may have no current empirical basis.

Organizing Farmers for Irrigation System O&M

As there are over 20,000 village irrigation systems scattered over Sri Lanka, their proper management and operation is almost impossible without farmers' assistance, and the *modus operandi* for the latter is considered to be through farmer organizations. Thus the establishment of farmer organizations has been incorporated as one of the main strategies of State-sponsored water management programs (Department of Agrarian Services 1984:5). The government's interest in establishing farmer organizations derives from two interrelated assumptions about the village community: village irrigation systems decayed as a result of the decline of traditional mechanisms for water management, and the government's presence in the village is needed to invest in physical rehabilitation and to organize farmers to look after the refurbished water sources. Thus the irrigation water management programs have to involve both the government and the community. "Since it is difficult for individual farmers to change this system, and since outside government assistance alone is unlikely to be effective, it will be necessary to strengthen both the government's capacity and the community's capacity to make these changes" (World Bank 1981).

Under the VIRP, for example, an attempt has been made to organize farmers or at least their representatives into the tank committees (TCs). The block-level farmer representatives come together with government officials under the chairmanship of the *vel vidane* to decide on the operations for the particular season, such as organizing agricultural inputs, providing agricultural extension advice, and resolving conflicts. There is a rough division of work between the farmer representatives and field-level officials within the TC. Irrigation and agricultural activities are generally performed by the latter as such tasks need extra-community activity, while matters that strictly concern the community are left to the former for mediation through the *vel vidane* (Abeyratne 1986b:6).

TCs are supposed to revive the principles of the traditional *gamsabhawa* to evolve an efficient water management system under tanks and anicuts. For the government, such an attempt is convenient as certain irrigation-related responsibilities can be given to the community. This would reduce government expenditures and the need for an

administrative set-up at the village level. Additionally, the involvement of farmers in O&M activities, the government believes, would allow them to develop some sense of proprietorship over the water source and this in turn would provide feedback on field performance to the irrigation officials.

From the farmers' viewpoint, the TC is not a farmers' organization. It was introduced by the government and its decisions are primarily taken by the officials because they have the necessary legal and administrative backing to implement certain decisions and remedial actions (Abeyratne 1986a:7). Such officials are not accountable to farmers but to the government. As a result, the TC derives its authority more from the State than from the farmer community. These factors undermine the importance of farmers' participation in water management activities in village irrigation systems.

Little opportunity to participate is sometimes compounded by little incentive to participate. For one thing the village tank does not enjoy the primacy that it had in the past and landholdings under the tank are extremely fragmented and do not meet subsistence requirements. All these factors make it difficult to elicit even the limited farmer participation envisaged from the village-level organizations (Abeyratne 1986b:18).

Another factor limiting community-wide farmer participation in water management is that the village community is not always coterminous with the community represented in the organization. Earlier, only the proprietors took part in seasonal meetings; now the representatives of all operators of land and several field officials take part in the TC meetings. Sometimes, after rehabilitation of a tank, different groups within a village may compete for water for different purposes. Kehellanda Village in Monaragala District is a good example. Here two main groups -- farmers and fishermen -- have conflicting uses for the water in the tank (see Abeyratne and Perera 1986, Abeyratne 1986a:19). Unless there is a clear and realistic delineation of irrigation and other water-user boundaries, it is difficult to elicit farmers' cooperation in O&M tasks.

Another factor that discourages farmers' participation in water management is that the traditional notions of property clash with present-day legal definitions of property. In the past, the farmers considered the tank and its products, fish and water for paddy fields, as village property; unless one could show claim over village communal property, one was not treated as a member of the village community. The rights over communal property were derived from membership in a kindred group called village *variga*, which was decided by the village elders. However, with the granting of land deeds for individual property and the sale of new lands served by village tanks after their rehabilitation, ambiguity exists as to who owns the irrigation works. For example, in some village irrigation systems studied in the Monaragala District, this ambiguity was evident. As mentioned earlier, in already rehabilitated tank systems, two-thirds of villagers said that the government owned the irrigation system. On the other hand, in those systems that had not yet undergone rehabilitation, the farmers said that they owned the irrigation systems and thus they felt an obligation to maintain them.

Therefore it seems useless to expect farmers served by rehabilitated tanks to take part in O&M unless some compulsory rules are introduced. As history demonstrates, this was the case even in the 1870s when the government enacted rules directing every farmer to contribute his free labor toward maintaining the tank. Each farmer had to work 60 days during the first year after the renovation of the tank and 30 days per year thereafter.

Farmers cannot be expected to spend time organizing themselves to undertake collective action unless they can derive substantial economic benefits from that activity. Many of the tanks refurbished so far, especially in the North Central Province, still do not provide enough water to cultivate the entire *yaya* (tract) even in *maha*. "Owing to the uncertainty of availability of irrigation water, however, the chances of raising a successful crop even in the *maha* is estimated at less than 75 percent in some areas" (ADB 1980). Therefore farmers are unlikely to organize themselves for maintenance of their tanks and adoption of better water management practices under all conditions.

What is really needed in present-day village irrigation systems is strengthening of the capacity of existing farmer organizations by providing them with technical and financial support. The TC or the *wew-sabha* (reservoir council) may be capable of maintaining tanks as long as maintenance work involves only human labor. But if maintenance involves some technical know-how, then the farmer organization may be unable to perform the task. In such a situation, farmers need money and technical help. The NFFHC has evolved a sound strategy to meet both requirements. The *wew-sabha* is responsible for all construction and maintenance, and in this regard, the farmers get comprehensive training on how to maintain and repair tank bunds and channels. The Reservoir Maintenance Fund with regular contributions from farmers will eventually be the source of finance for such activities.

Cultivating Part of the Command Area in Periods of Water Shortage (Bethma)

The present water management programs under village irrigation systems attempt to revive the traditional practice of *bethma* to stop the wastage of water in *yala*. The main principle behind this practice is to cultivate a portion of the paddy field using the limited water in the tank which is not sufficient to cultivate the entire tract. When it is decided at the seasonal meeting to do *bethma* cultivation, a portion of land adjacent to the tank is demarcated by the farmer representative (FR, previously referred to as the *vel vidane*) as the area that will be cultivated by the entire community for that season. One important aspect of *bethma* is the exclusion of tenants, leaseholders, and mortgagees from the season's farming activity. The permanent boundaries of each *pangu* (share) are ignored for the time being and the group collectively cultivates the area that has been demarcated. The harvest is thereafter divided according to the size of the *pangu* each member holds in the entire paddy tract (Abeyratne and Perera 1984:80).

Under the tanks restored by the NFFHC's *wew-sabhas*, *bethma* is an in-built component of the agricultural system. The entire paddy area served by the tank is divided into upper, middle, and lower fields. In each field all the villagers hold plots. Therefore, the *wew-sabha* can decide the extent the community should cultivate according to the amount of

water stored in the tank. In years of poor rainfall, the wew-sabha may decide to cultivate the upper field only. In the years of normal rainfall, the middle and lower fields may be cultivated.

In the Dry Zone villages, bethma is no longer practiced during yala even when there is water in the tank. An Asian Development Bank (ADB, 1980) study concluded that 87 percent of paddy land was allowed to lie fallow during yala in Anuradhapura District. However, the water management program proposes to stop wasting water from non-cultivation during yala by re-establishing the bethma practice through farmer organizations. Historical evidence shows that bethma had never been a regular practice in Sri Lanka. Farmers in the Dry Zone cultivated rice only in maha and concentrated on chena cultivation during yala. However, when farmers could not cultivate rice for several seasons due to drought, they tended to cultivate a small portion of paddy land collectively close to the tank to raise at least rice for seed for the subsequent season. This practice was then known as the "distribution of seed paddy equally among villagers" (Perera 1985a).

The decay of the bethma practice is more an outcome of the changing patterns of the production system than an outcome of social decay or the disappearance of traditional customs in rural Sri Lanka. The more plausible reason for its disappearance would be the increase in the area irrigated by the tank which reduces water availability during yala even in rehabilitated tanks. Begum (1985) has shown that in 18 out of 20 village tanks studied in the North Central Province, the area of irrigated land served by each tank had increased significantly during the last several decades from the original size of the *purana-wela* (old field). Such increases resulted from several changes: first, the government began to sell new lands after the refurbishment of tanks; these are known as *akkara-wela* (new-fields). Second, population pressure in the tank-based villages increased. When farmers cultivate "reservation" lands and new lands below the tank without increasing the tank's storage capacity, the tank will not have enough water to irrigate the total area, even in maha. In such cases, there is little possibility of cultivating even a small section of the command area during yala. Third, the majority of irrigated lands in the Dry Zone are prepared for cultivation using tractors. Tractors facilitate dry sowing in some soil types where non-mechanized dry land preparation is not always possible. This sometimes encourages the cultivation of land beyond the *akkara-wela*.

In some villages, although officials reported the practice of bethma, the actual practice seems to be the purchase of a farmer's rights by a wealthy farmer or a group of farmers. Thus, some farmers sold their bethma right, mainly because of the lack of capital to cultivate even a small portion of land during yala. They thus freed themselves from paddy cultivation to concentrate on chena cultivation on a full-time basis. The buyer of such cultivation rights either cultivated his leased-in land or left it fallow according to the amount of water available in the tank.

Quite often, the land operators in the *purana-wela* tended to cultivate their holdings with the limited amount of water available in the tank. The old practice of annual alternative cultivation of *purana-wela* and *akkara-wela* is now rarely practiced.

When water is inadequate to cultivate even the *purana-wela*, some individual farmers who have land holdings close to the tank cultivate them privately (Abeyratne and Perera 1986).

These new practices reflect some of the radical changes that have taken place in villages during the last few decades. The main characteristics of the traditional village communities, such as subsistence ethics and social insurance, are no longer visible in the production system. Thus, any attempt to reinstitute traditional features of village economic organization will be unsuccessful if the policy makers fail to understand: 1) the organizational set-up which existed in the past and the factors which contributed to their operation, and 2) the factors that have caused structural changes in the village communal forms.

Allocation of Water from Tail end to Head end Reaches

Until recently, the cultivation of tail-end (*agatha*) holdings in the command area under village tanks had low priority in development planning. The main problem faced by tail-end cultivators is insufficient supply of water. This situation becomes worse in times of water scarcity, resulting in reduced yield or crop failure. Water management programs try to overcome this by reversing the water distribution from head-to-tail to tail-to-head.

However, to implement this strategy successfully, there should be: 1) suitable field channels and control structures to facilitate its operation, and 2) changes in existing water management practices requiring farmer participation and cooperation.

Rehabilitation programs have focused on the first requirement, and in many villages farmers have cooperated in accomplishing it. However, when implementing the second, problems began to emerge. This practice completely ignores the tradition-bound claim the *purana-wela* farmers have over the water in the village tank. Thus, tail-to-head allocation of water is likely to antagonize the head end farmers who may view this as an intrusion of established rights of cultivation.

Tail-to-head water allocation is being reported from recently rehabilitated anicuts in Moneragala District. In Pussellawa anicut system, for example, the tail end receives water first and then the middle field, and finally the head end. This is a new strategy and farmers explained that this was possible because of the availability of sufficient water in the stream for irrigated rice. When asked how they expected to distribute water from the anicut during a period of water scarcity, they said that they did not know, and indicated that they would probably allow the head end farmers to cultivate their fields. In case of unanticipated water shortages in the anicut after cultivation starts, the farmers expect to give up cultivating the tail end first followed by the middle field to allow the head-end farmers to cultivate their holdings.

The question of tail-to-head water distribution in tank-based village irrigation systems arises only when there is a shortage of water to cultivate the entire paddy field. In such instances, farmers would prefer to resort to well-established traditional practices such as *bethma* or to give up paddy cultivation for the season in order to concentrate on *chena* cultivation.

The irony is that when water is abundant, the tail-to-head allocation becomes redundant; when water is scarce, it becomes impracticable and irrational. In the latter case, the appropriate method would be to allocate water to some plots at the head end to avoid a total crop loss.

A main difficulty in the tail-to-head allocation of water is that water is to be conveyed to the tail end through the head end fields. If there is any doubt about getting sufficient water to their plots, the head end farmers certainly will not allow water to pass their plots without irrigating their own fields. This prior physical access to water allows the head end farmers to resort to various methods of illicitly channeling water to their plots, such as by blocking field channels and cutting the main channel. On the other hand, the irrigation bureaucracy or farmer organization is unable to supervise the delivery of water to the tail end first because it requires a 24-hour vigilance. Such "policing" may lead to clashes among the head-end farmers, the officials, and the tail-end farmers.

Another major obstacle comes from the influential head end farmers. Usually, rich and influential farmers own large tracts of the best land just below the tank. In the past, the *vel vidane*, village headman, and other influentials possessed the most prized lands below the tank. Thus, they managed to get the water first. However, when the government began to sell Crown Land in the *akkara-wela*, these influentials managed to buy new lands and attempted to get water to these lands too. For this reason, the practice of issuing tank water to the *purana-wela* during *maha* and to the *akkara-wela* in *yala* was introduced (see Perera 1985b).

Farmer representatives who own land at the head end of the paddy tract still obtain water for their fields first, along with their relatives and friends who too own land adjacent to their land. Begum (1985) mentions a case where a FR ignored the seasonal meeting decision to follow the tail-to-head allocation of water. He, together with his relatives and friends, obtained water first for their fields in the *purana-wela* despite the protests of other farmers about their behavior.

Furthermore, influential farmers at the head-end can sabotage the operation of tail-to-head water allocation if they think such an allocation disturbs the cultivation of their land. Their wealth and personal connections with politicians provide them with enough influence over the villagers and officials. Political pressure from the local politicians to change the water allocation program decided at a seasonal meeting and getting non-cooperative officials transferred are not uncommon in many of the major irrigation systems. This is also true of the village irrigation systems.

CONCLUSIONS:

SOME POSSIBLE RESEARCH AREAS ON VILLAGE IRRIGATION SYSTEMS

From the above discussion, several conclusions can be drawn in relation to village irrigation communities in particular and to rural Sri Lanka in general. One is that there has been a process of accelerated State intervention into Sri Lanka's rural areas -- village

irrigation rehabilitation programs sponsored by the State are a prime example of this process. As a result, the State has managed to concentrate and consolidate its role in village irrigation systems. This inevitably develops an interaction between the government and the village community. This paper has shown the far-reaching changes that have been generated by State intervention into villages over time. However, in the course of the discussion on various strategies for water management, it became evident that the government has not fully understood the dynamics of community organization and as a result it has introduced several strategies which are destined to be unsuccessful. In this regard, further research is necessary on the nature and type of government-community interaction in both diachronic and synchronic perspectives before any meaningful strategy is designed for refurbishing village irrigation systems by the State. It is important to decide the degree of each party's involvement -- both financial and in terms of decision-making responsibility -- in the rehabilitation process.

Related to this is the issue of community or village capacity to handle village irrigation affairs. At present, although both State and community capacities are emphasized, in reality, the emphasis is on the former as reflected for example, in the composition of the TC under the VIRP. In this regard, some systematic archival research into the village community's role in both physical refurbishment of village tanks and their management in the latter part of the 19th century may throw some light on why some institutional mechanisms for water management functioned well in those days and why they cannot be reintroduced today to play an equally effective role in water management. Such a historical survey will show whether the traditional water management mechanisms decayed over time or were intentionally abandoned as a result of changing priorities in the development activity (e.g., from small village tank rehabilitation to large-scale irrigation works) of the State. Research will also show the contribution of the State to this change over time. Such research will help in identifying factors that strengthen a village's capacity to handle its own water management activity.

Further research is urgently needed on socio-economic and cultural patterns of community life to understand how and why villagers accommodate or reject new strategies. An understanding of these patterns can inspire social engineering of the proposed changes so that they fit the social and cultural systems of the village community.

NOTES

¹Exchange rate in 1986 was US\$ 1.00 = Rs. 28.00.

²Minor irrigation systems are defined as those where the area irrigated is less than 80 ha. The terms village irrigation system, minor irrigation system, and small-scale village irrigation systems are used interchangeably.

³Asweddumization is an English word derived from Sinhala and means leveling land and constructing bunds around a field to retain water for rice cultivation.

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